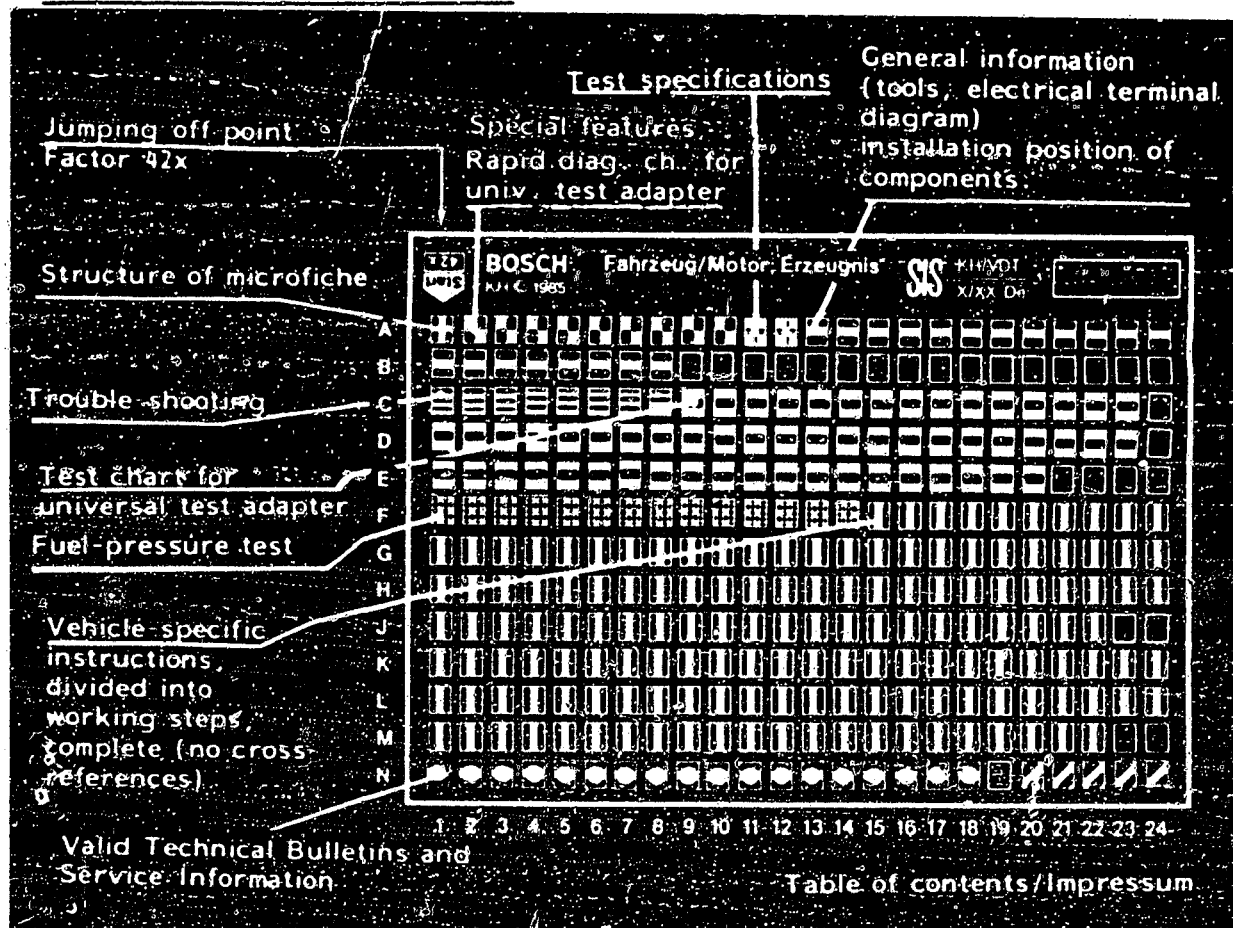


Structure of microfiche

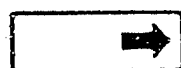


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

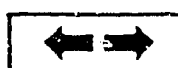
E16	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



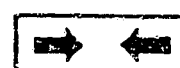
Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1

Trouble-shooting program



SPECIAL FEATURES

The L-Jetronic (LH 2 version) is installed for the first time in Europe in the Porsche 928 S with 4.7 1/8-cyl. V-engine.

This microcard also includes the versions for Sweden, Switzerland and Australia.

In addition, the modifications as of 10.84

- Digital LH-control unit
- Hot-wire air-mass sensor instead of air-flow sensor.
- Cold-start control
- Adaptive overrun cutoff
- Double temperature sensor II (engine) for Jetronic and electronic ignition system.
- Main relay and pump relay are installed instead of a control relay (in central-electrics box).
- Two pressure regulators.
- Secondary-air injection.

The control unit and the peripherals are checked during the test with the universal test adapter (special LH2 adapter lead).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system with the universal test adapter.








The rapid diagnosis chart contains the following information

- Sequence of test steps
- Settings of V and Ω program switches
- Notes on how to operate the universal test adapter or other components
- Test specifications for motortester and multimeter
- References to coordinates of the respective detailed testing and trouble-shooting program.

If detailed information and instructions are required, always proceed in accordance with the trouble-shooting charts starting on Coordinates C1/C2.



Rapid diagnosis chart for universal test adapter

Test step	Switch setting		Measurement	Remarks	Test specifications (Reading)	For trouble-shooting see Coordinates
	V	Ω				
1		5	Resistance of temperature sensor NTC II (engine temperature). On control-unit plug between term. 2 and term. 11.	Connect adapter lead to peripherals <u>only</u> .	(+15°C...+30°C): 1.45...3.3 k Ω (+80°C): 280...360 Ω	C 12
2		6	Resistance of output stage ground. On control-unit plug between term. 2 and term. 11.	Connect adapter lead to peripherals <u>only</u> .	0...10 Ω	C 14
3		7	Resistance of ground terminal of sensors. On control-unit plug between term. 5 and term. 11.	Connect adapter lead to peripherals <u>only</u> .	0...10 Ω	C 16
4		8	Resistance of all 8 parallel-connected injection valves and, in series with them, the electric fuel pump. On control-unit plug between term. 13 and 11.	Connect adapter lead to peripherals <u>only</u> .	(+15°C...+30°C): 6.0...8.2 Ω (+80°C): 6.2...8.5 Ω	C 18
5		9	Resistance of idle contact in throttle-valve switch. On control-unit plug between term. 3 and term. 11.	Connect adapter lead to peripherals <u>only</u> . Accelerator in rest position.	0...10 Ω	D 1
6		10	Resistance of full-load contact in throttle-valve switch. On control-unit plug between term. 12 and term. 11.	Connect adapter lead to peripherals <u>only</u> . Accelerator in full-load position.	0...10 Ω	D 3
7		21	Potentiometer for idle mixture adjustment. On control-unit plug between term. 14 and term. 6.	Connect adapter lead to peripherals <u>only</u> . Resistance is dependent on CO setting.	150...600 Ω	D 5
8	4	21	Voltage from starting motor term. 50. On control-unit plug between term. 4 and term. 11.	Connect adapter lead to peripherals <u>only</u> . Shift gear to neutral, start.	8...15 V	D 2

A3

Rapid diagnosis chart
Porsche 928 S



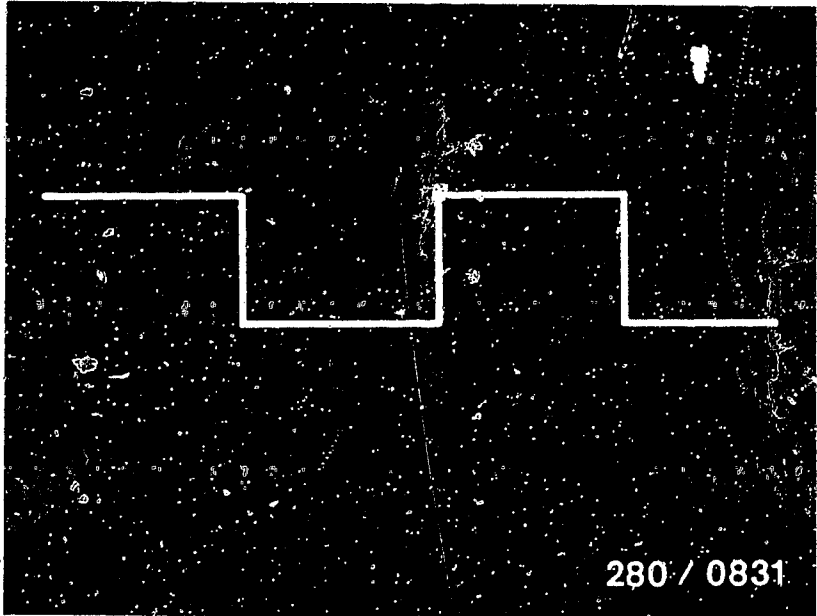
A4

Rapid diagnosis chart
Porsche 928 S



Rapid diagnosis chart for universal test adapter

Test step	Switch setting		But-ton	Remarks	Test specifi-cations (Reading)	For trouble-shooting see Coordinates
	V	Ω				
9	5	21	-	Connect adapter lead to peripherals <u>only</u> . Ignition "ON". Measure t_n signal with oscilloscope. Shift gear to neutral and start. Voltage pulses from electronic ignition control unit term. 16. On control-unit plug between term. 1 and term. 11.	See top diagram (approx. 10 V amplitude)	D 11
10	6	21	4	Connect adapter lead to peripherals <u>only</u> . Ignition "ON". Voltage from main relay term. 87. On control-unit plug between term. 9 and term. 11.	8...15 V	D 15
11	7	21	-	Connect adapter lead to peripherals <u>only</u> . Ignition "ON". Voltage from power-supply relay term. 87. On control-unit plug between term. 18 and term. 11.	8...15 V	D 18
12	8	21	-	Connect adapter lead to peripherals <u>only</u> . Ignition "ON". Voltage at main relay (winding) term. 85. On control-unit plug between term. 21 and term. 11.	8...15 V	D 21



t_n signal

A5

Rapid diagnosis chart
Porsche 928 S



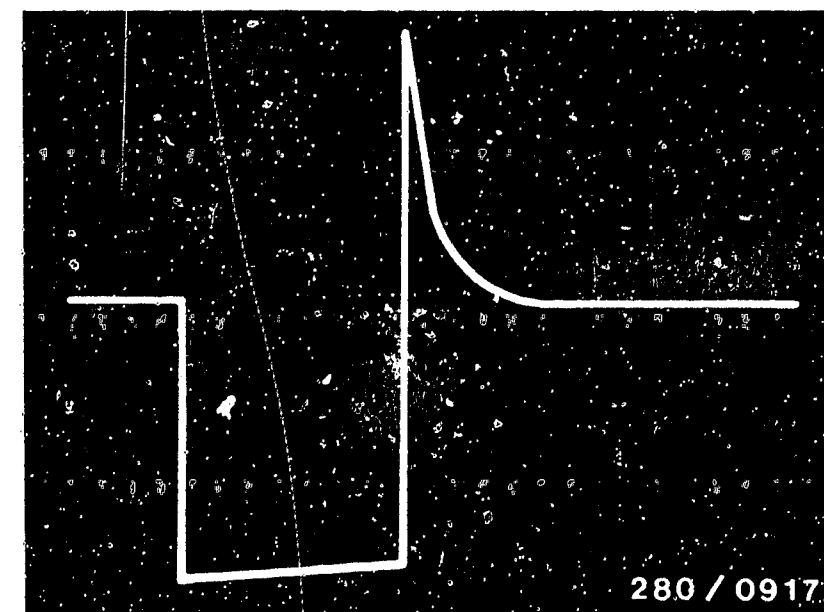
A6

Rapid diagnosis chart
Porsche 928 S



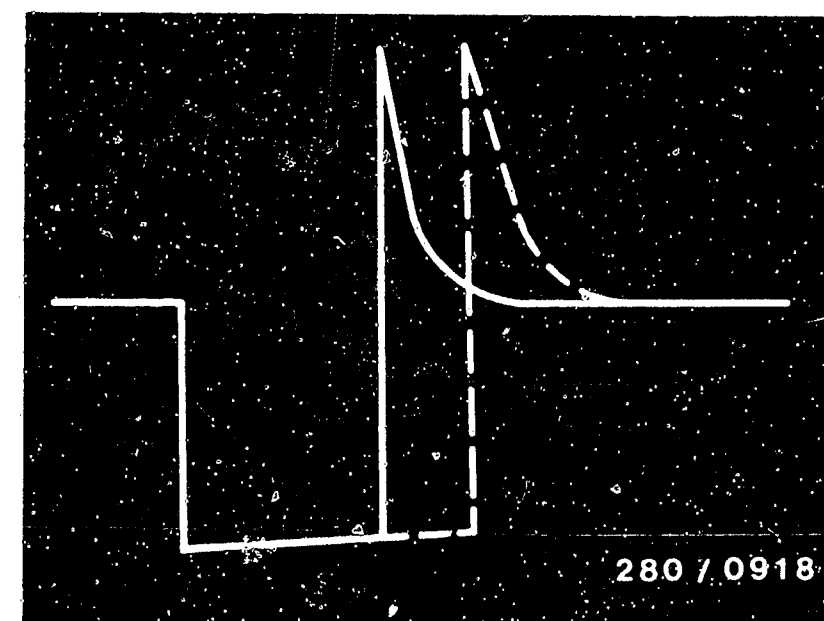
Rapid diagnosis chart for universal test adapter

Test step	Switch setting		But-ton	Remarks	Test specifi-cations (Reading)	For trouble-shooting see Coordinates
	V	Ω				
13	9	21	-	Ignition "OFF". Connect adapter lead to control unit and peripherals. Ignition "ON". Voltage at pump relay (winding) term. 85. On control-unit plug between term. 17 and term. 11.	8...15 V	E 1
14	3	21	-	Start engine and let run. Output voltage of hot-wire air-mass sensor between term. 5 and term. 3. On control-unit plug between term. 7 and term. 6. If engine speed changes, the output voltage must also change.	2...5 V	E 4
15	12	21	-	Functional test of control unit with engine running and at normal operating temperature. Check injection signal ti from control unit with oscilloscope. On control-unit plug between term. 13 and term. 11.	See top diagram	E 8
16	12	21	1	As 15, but after pressing button (NTC II cold) duration of injection becomes slightly longer (press briefly).	See bottom picture	E 10
17	12	21	2	As 15, but after pressing button (NTC II warm) duration of injection must remain constant.	See top picture	E 12



Injection signal

Widened injection signal after pressing button T1



A7

Rapid diagnosis chart
Porsche 928 S



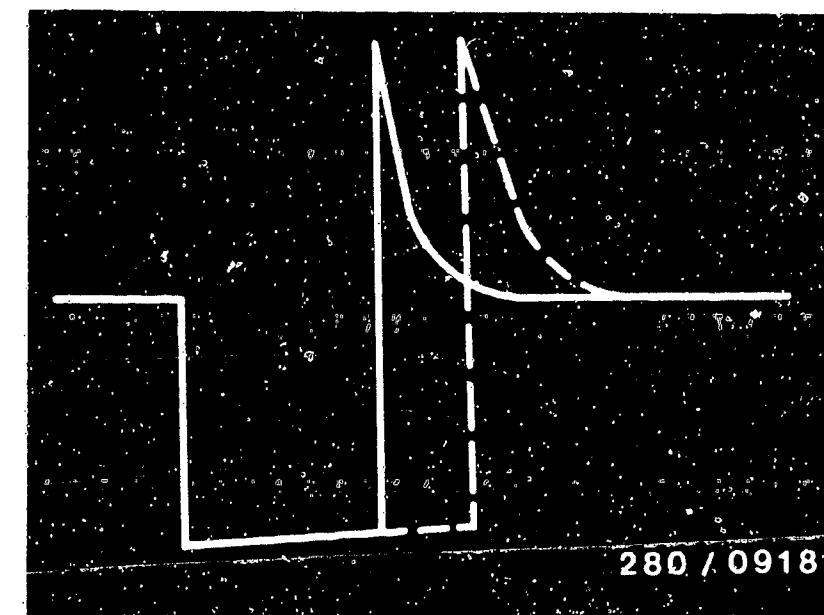
A8

Rapid diagnosis chart
Porsche 928 S



Rapid diagnosis chart for universal test adapter

Test step	Switch setting		But-ton	Remarks	Test specifi-cations (Reading)	For trouble-shooting see Coordinates
	V	Ω				
18	12	21	5	Functional test of control unit. Hold engine speed constant at 2000 min ⁻¹ . Overrun cutoff. Press button 5. Injection signals stop and resume again at approx. 1300 min ⁻¹ . Repeat test: Release button 5 and then press again.	Briefly no in- jection signals	E 14
19	12	21	6	Functional test of control unit Idle. Full-load enrichment. When button 6 is pressed, the in- jection signal must become slightly wider/or the engine speed must increase.	See top diagram	E 16
20	13	21	-	Testing of hot-wire air-mass sensor. Voltage measurement of self- cleaning function. Before this test, the engine must run at above 2000 min ⁻¹ . Then ignition "OFF" - voltage reading after approx. 4 sec.	2...5 V (Duration of reading approx. 1 s)	E 18



Widened injection signal after pressing button T6

A9

Rapid diagnosis chart

Porsche 928 S



A10

Rapid diagnosis chart

Porsche 928 S



TEST SPECIFICATIONS

Pressure regulators

- Fuel pressure 2.3 ... 2.7 bar

Electric fuel pump

- Fuel delivery (measured in return): min. 1350 cm³/30 s
- Terminal voltage (under load): min. 12 V

Temperature sensor II (engine) (blue plug)

- Electrical internal resistance at ambient temperature (+15°C...+30°C): 1.45 ... 3.3 kΩ
with engine at op. temp. (approx. +80°C): 280 ... 360Ω

Solenoid-operated injection valve (at +15°C...+30°C):

- Electrical internal resistance 2.0 ... 3.0Ω

Hot-wire air-mass sensor

Electrical internal resistance
between term. 6 and term. 3: 0 ... 1100Ω

between term. 5 and term. 3: 3.6 ... 4.1Ω



Idle speed:

700 ... 750 min⁻¹

Exhaust-gas setting, CO
concentration

(with engine at normal
operating temperature and
with secondary-air in-
jection disconnected).

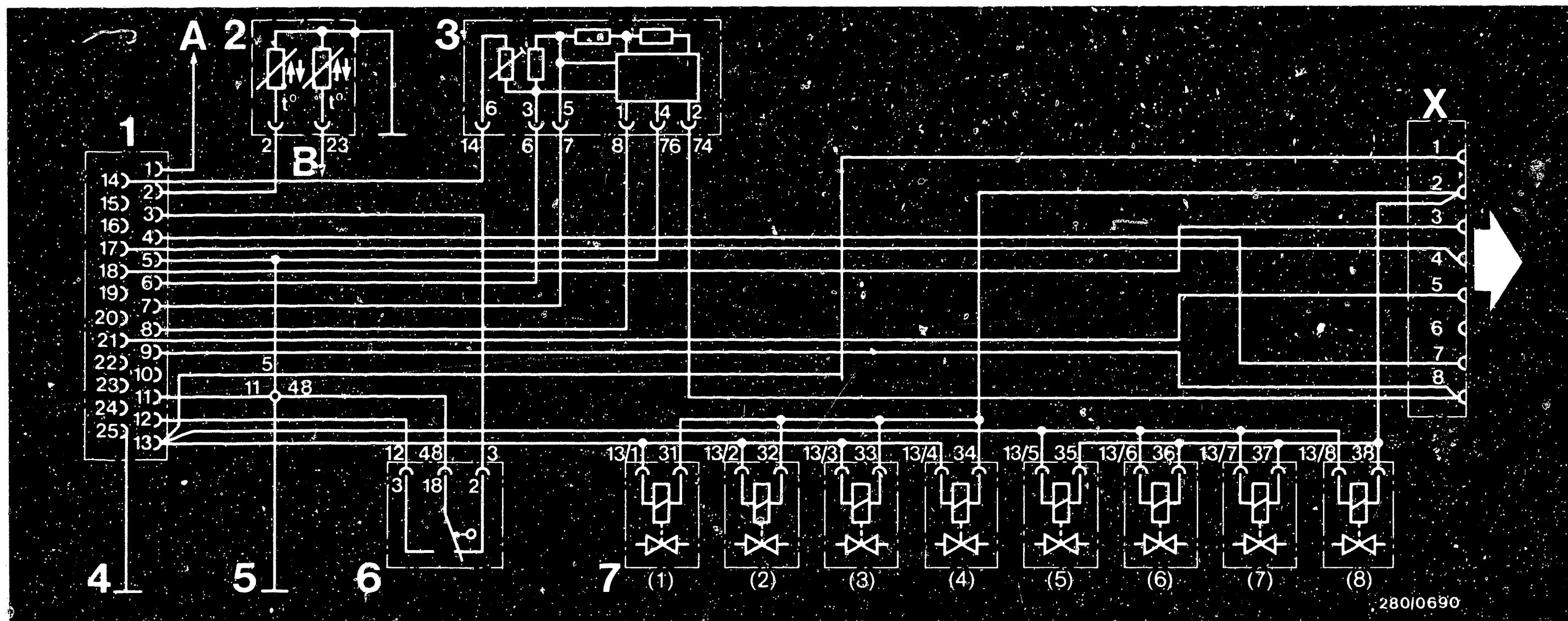
0.5 ... 1.5 vol. % CO

Australia, Sweden,
Switzerland version:

0.5 ... 1.0 vol. % CO

See equipment and Autodata microfiches for settings for
ignition, valve clearance, and other engine data.





ELECTRICAL TERMINAL DIAGRAM (up to 9.84)

1 = Control unit
 2 = Double temperature sensor
 1 temperature sensor - Jetronic
 1 temperature sensor - ignition (B)

3 = Hot-wire air-mass sensor
 4 = Output stage ground terminal
 5 = Electronics ground terminal
 6 = Throttle-valve switch

7 = Injection valves
 A = To electronic ignition control unit term. 16
 B = To Electronic ignition control unit term. 23
 X = 8-pin plug - central-electrics box

A13

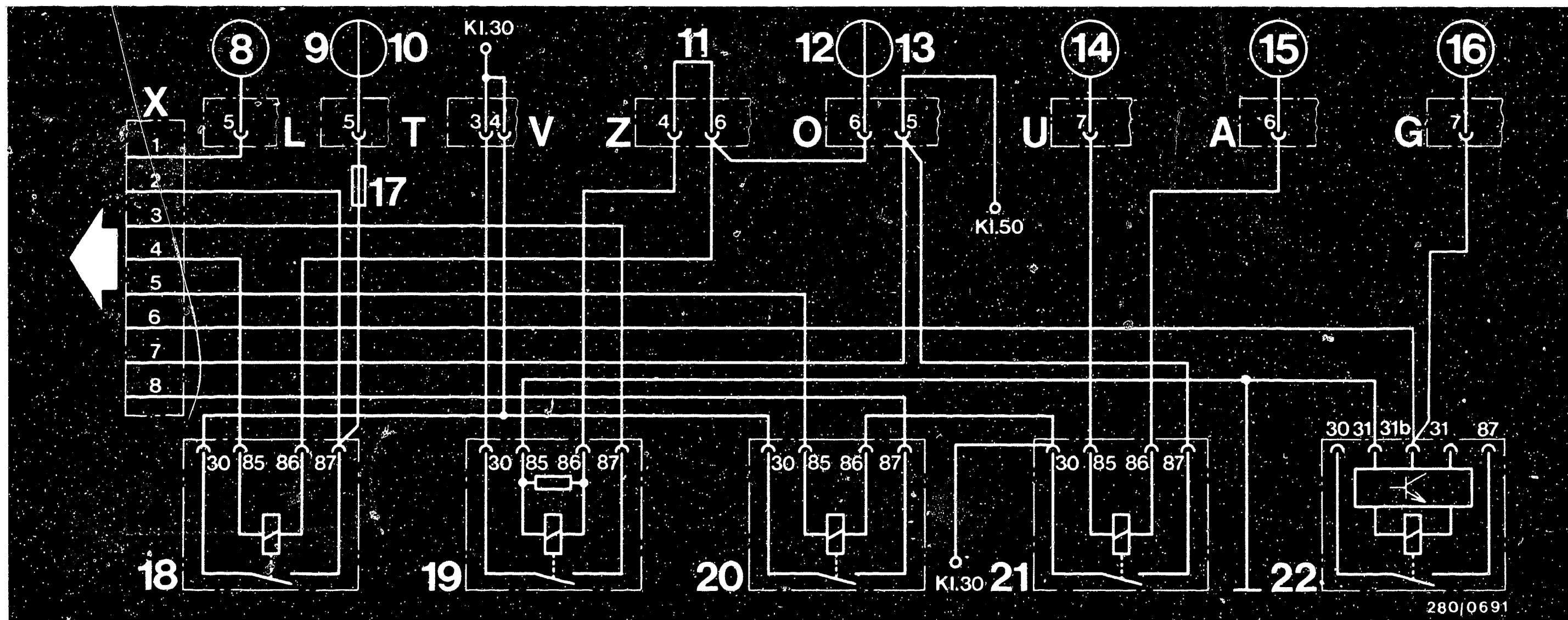
Electrical terminal diagram
 Porsche 928 S



A14

Electrical terminal diagram
 Porsche 928 S





Terminal diagram of central-electrics box (connecting leads for LH version) (up to 9.84)

X = 8-pin plug - central-electrics box:

- 1 = To LH control unit term. 13
- 2 = Positive power supply to injection valves
- 3 = To LH control unit term. 18 and electronic ignition control unit term. 25
- 4 = To LH control unit term. 17
- 5 = To LH control unit term. 21
- 6 = To electronic ignition control unit term. 16
- 7 = To LH control unit term. 4
- 8 = To LH control unit term. 9 + hot-wire air-mass sensor term. 2

- 8 = Fuel consumption meter
- 9 = Electric fuel pump
- 10 = Auxiliary-air device
- 11 = Jumper (not on vehicles with alarm system)
- 12 = Ignition coil 1 term. 15
- 13 = Ignition coil 2 term. 15

- 14 = Start immobilization/backup lamp switch
- 15 = Steering lock term. 50
- 16 = Tachometer and fuel consumption meter
- 17 = Pump fuse
- 18 = Pump relay
- 19 = Power supply relay

- 20 = Main relay
- 21 = Starting relay
- 22 = Kick-down relay
- X, L, V, T, Z, O, U, A and G = 8-pin plug in central-electrics box

A15

Electrical terminal diagram

Porsche 928 S

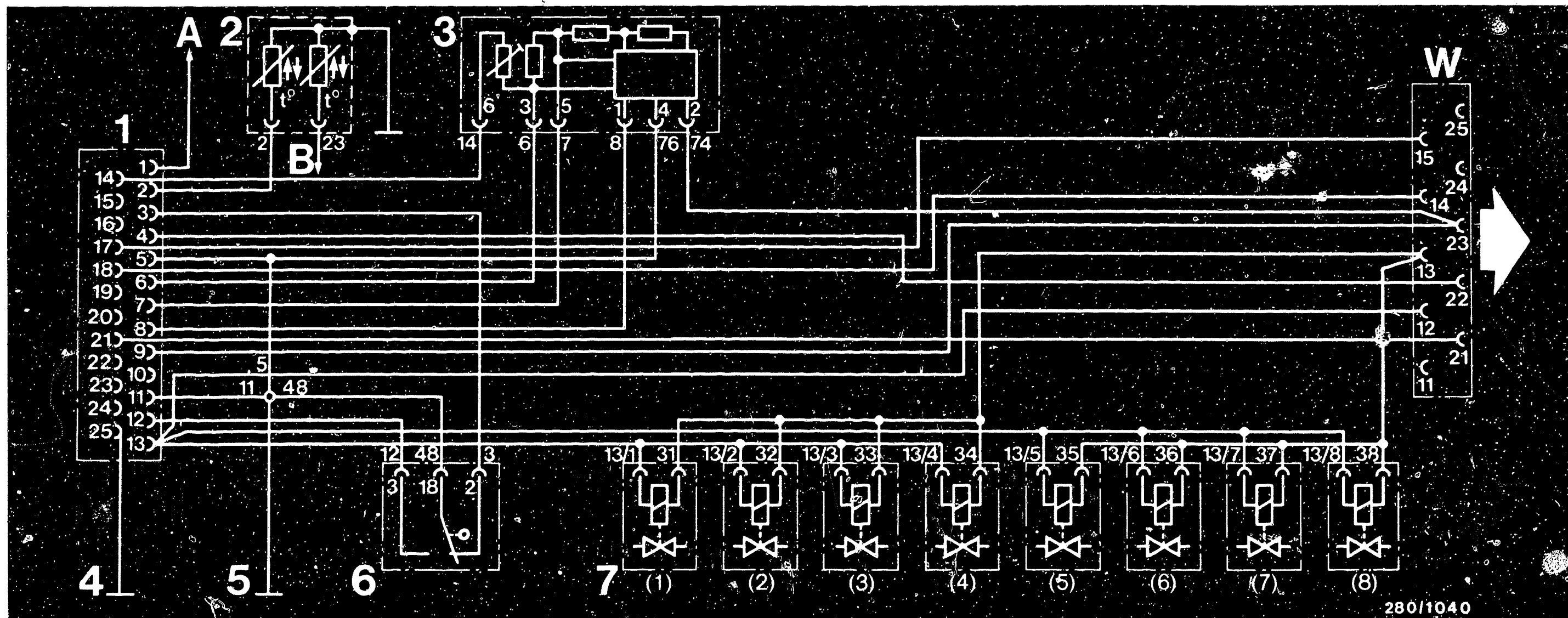


A16

Electrical terminal diagram

Porsche 928 S





280/1040

ELECTRICAL TERMINAL DIAGRAM (as of 10.84)

- 1 = Control unit
- 2 = Double temperature sensor
 - 1 temperature sensor - Jetronic
 - 1 temperature sensor - ignition (B)

- 3 = Hot-wire air-mass sensor
- 4 = Output stage ground terminal
- 5 = Electronics ground terminal
- 6 = Throttle-valve switch

- 7 = Injection valves
- A = To electronic ignition control unit term. 16
- B = To electronic ignition control unit term. 23
- W = 10-pin plug - central-electrics box

A17

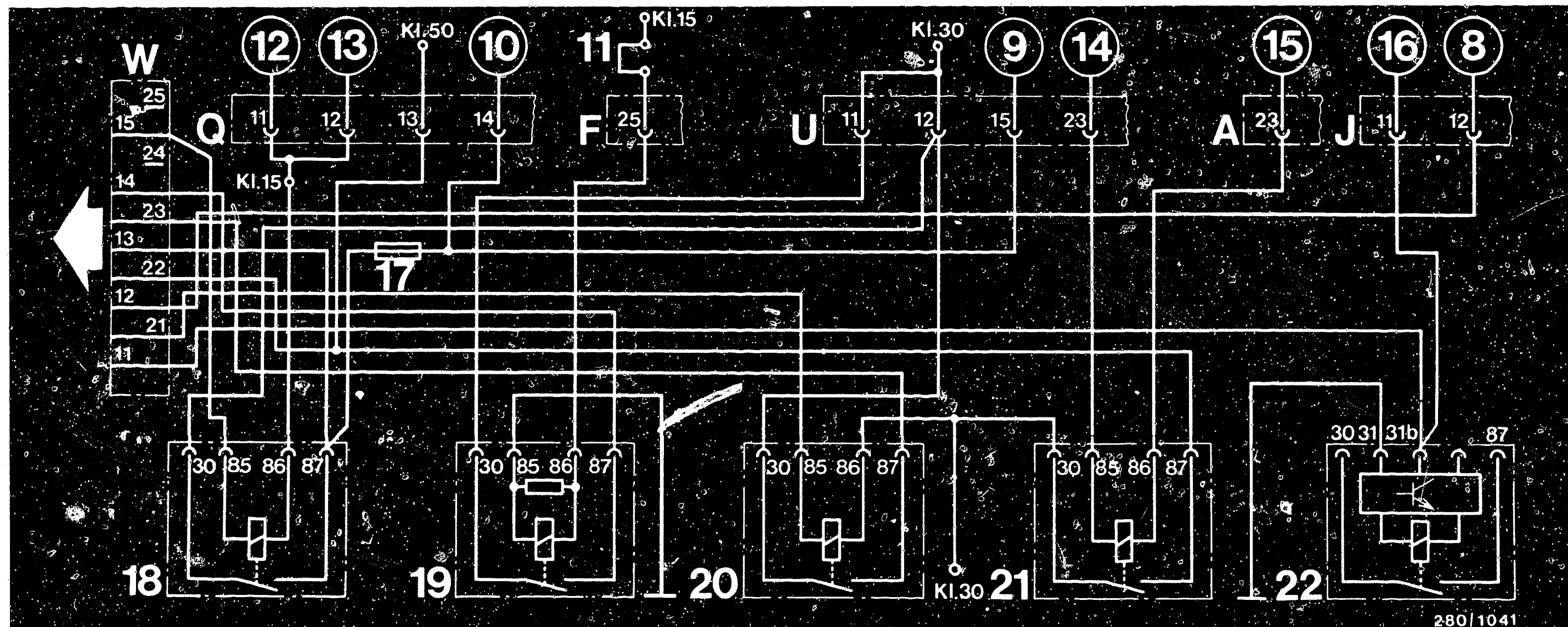
Electrical terminal diagram
Porsche 928 S



A18

Electrical terminal diagram
Porsche 928 A





Terminal diagram - central-electrics box (connecting leads for LH version) (as of 10.84)

W = 10-pin plug - central-electrics box

11 = To electronic ignition control unit term. 16
 12 = To LH control unit term. 13
 13 = Positive power supply to injection valves
 14 = To LH control unit term. 18
 15 = To LH control unit term. 17
 21 = To LH control unit term. 21
 22 = To LH control unit term. 4
 23 = To LH control unit term. 9 and hot-wire air-mass sensor term. 2

8 = Fuel consumption meter
 9 = Electric fuel pump
 10 = Auxiliary-air device
 11 = Jumper (not on vehicles with alarm system)
 12 = Ignition coil 1 term. 15
 13 = Ignition coil 2 term. 15
 14 = Start immobilization/backup lamp switch term. 50 or jumper to ground for manual transmission
 15 = Steering lock term. 50
 16 = Tachometer

17 = Pump fuse
 18 = Pump relay
 19 = Power supply relay
 20 = Main relay
 21 = Starting relay
 22 = Kick-down relay
 A, F, J, Q and W = 10-pin plug in central-electrics box
 23 = Battery + (term. 30)

A19

Electrical terminal diagram

Porsche 928 S



A20

Electrical terminal diagram

Porsche 928 S



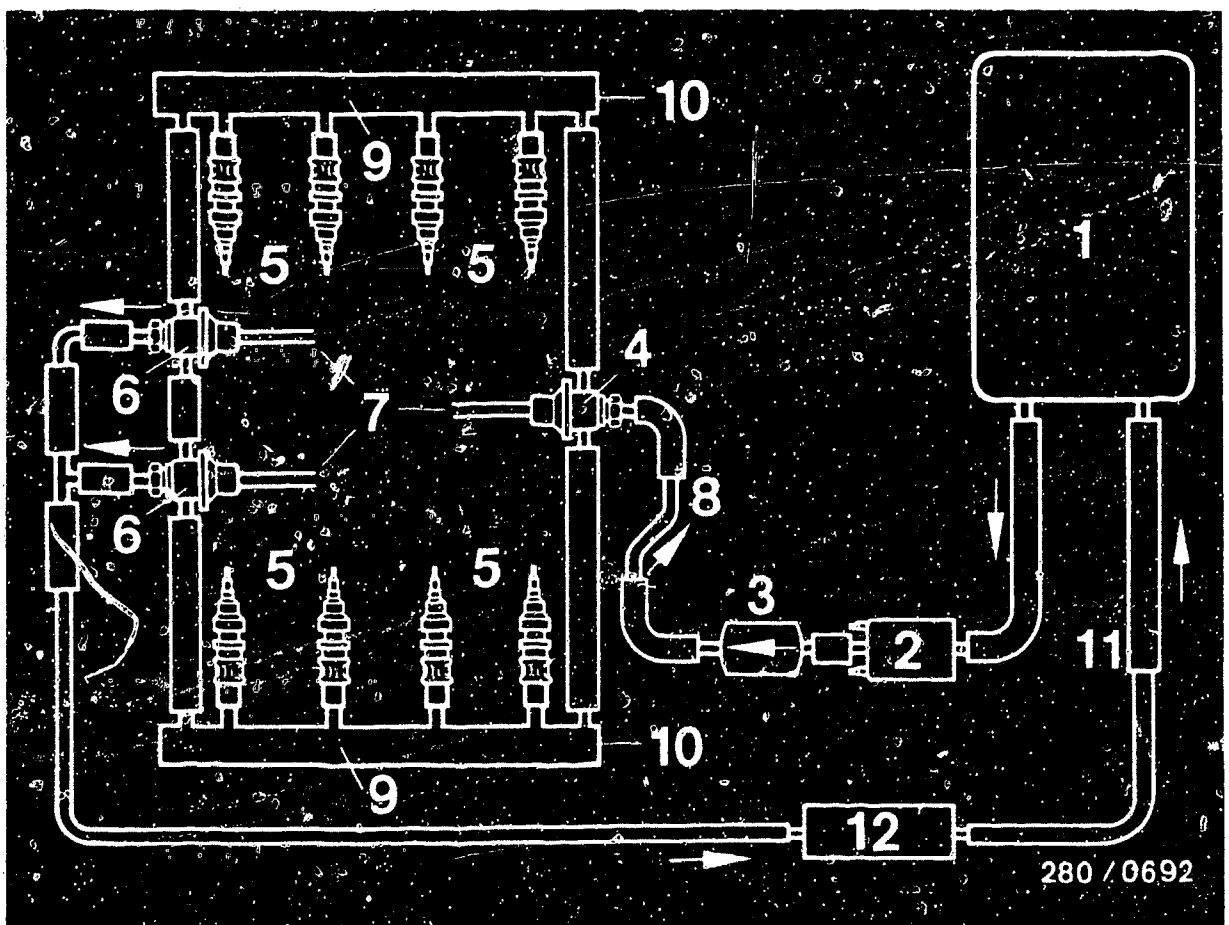
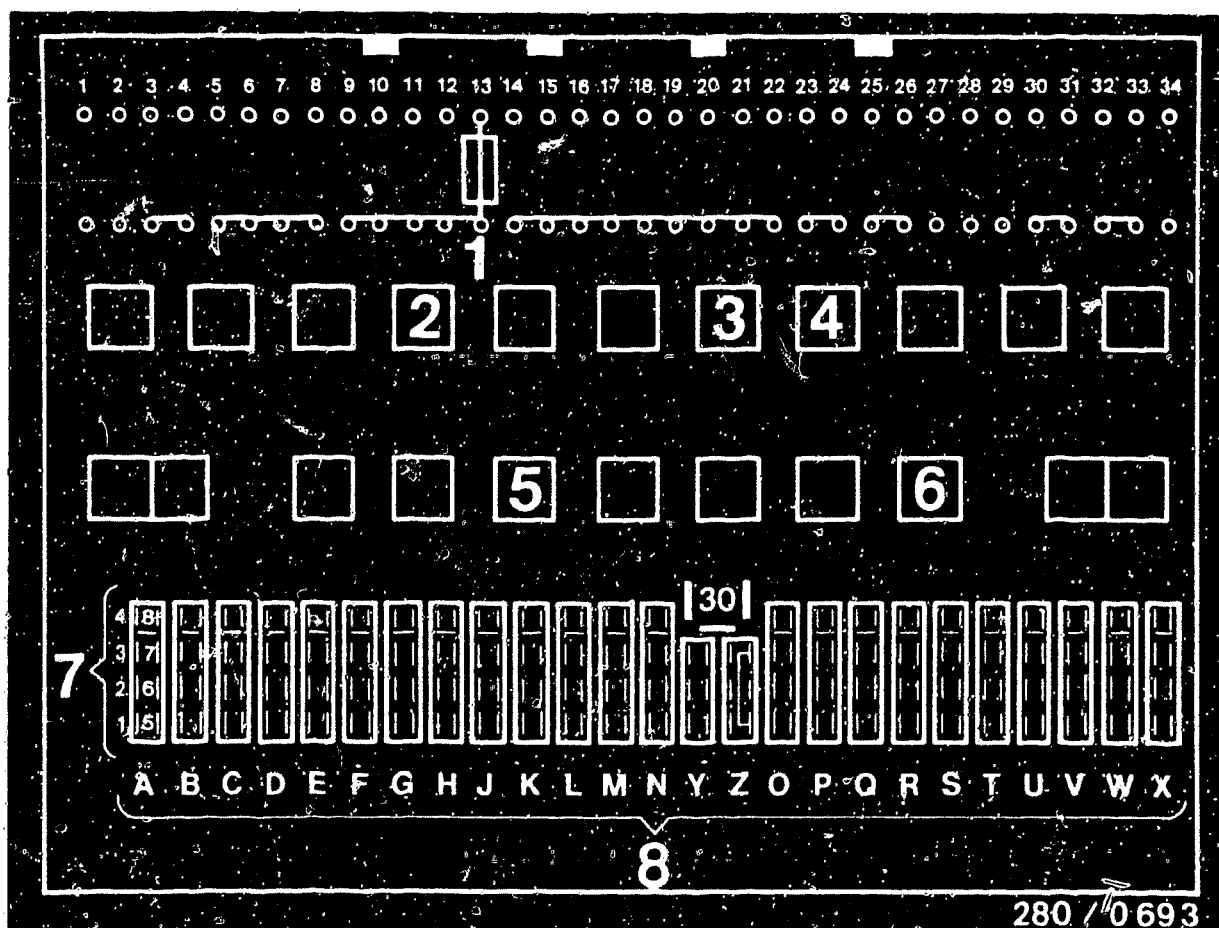


DIAGRAM OF FUEL LINES

- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel filter
- 4 = Pressure damper
- 5 = Solenoid-operated injection valves
- 6 = Pressure regulators
- 7 = Connection to intake manifold
- 8 = Fuel delivery line
- 9 = Fuel-distribution pipes
- 10 = Test connection for pressure gauge
- 11 = Fuel return line
- 12 = Fuel cooler



CENTRAL-ELECTRICS BOX (up to 9.84)

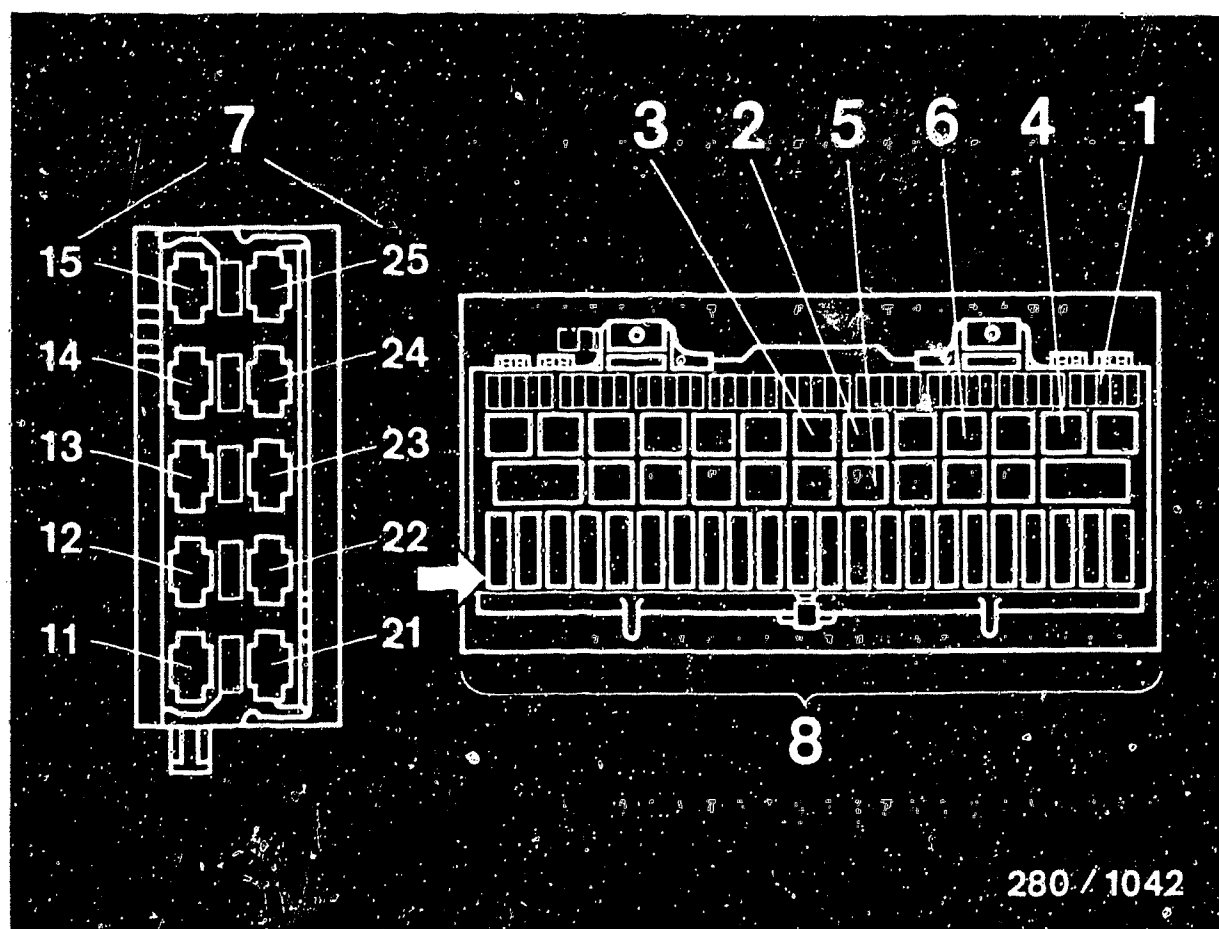
(Arrangement of relays, fuses and plug connectors)

Installation position:

Behind front passenger footwell cover plate, take away floor mat and hinge up running plate.

- 1 = Pump fuse (No. 13)
- 2 = Power supply relay
- 3 = Starting relay
- 4 = Main relay
- 5 = Kick-down relay
- 6 = Pump relay
- 7 = Pin numbering
- 8 = Central-electrics box plug





CENTRAL-ELECTRICS BOX (as of 10.84)

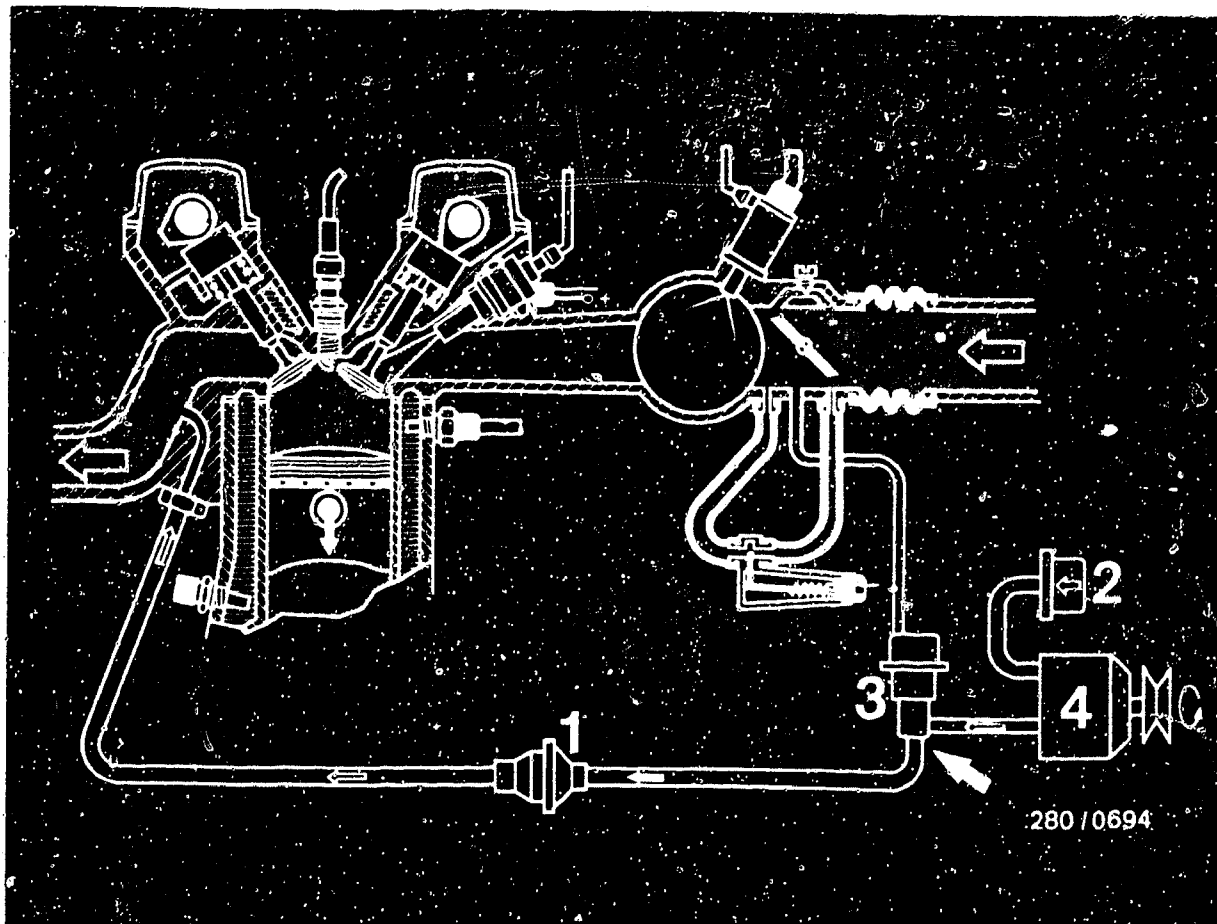
(Arrangement of relays, fuses and plug connectors)

Installation position:

Behind front passenger footwell cover plate, take away floor mat and hinge up running plate.

- 1 = Pump fuse (No. 42)
- 2 = Power supply relay
- 3 = Starting relay
- 4 = Main relay
- 5 = Kick-down relay
- 6 = Pump relay
- 7 = Pin numbering
- 8 = Central-electrics box plug





1 = Non-return valve
2 = Air filter for air pump

3 = Blow-off change-over valve
4 = Air pump

SECONDARY-AIR INJECTION

Operating principle (general):

An engine-driven air pump draws fresh air in through the air filter and blows it into the exhaust ports through a non-return valve. This results in partial afterburning of the CO and HC constituents in the exhaust gas. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system (to prevent overloading of the air pump at high exhaust back-pressures, the auxiliary air is directed by the change-over valve into the air filter as of an intake manifold vacuum of approx. 60 mbar).

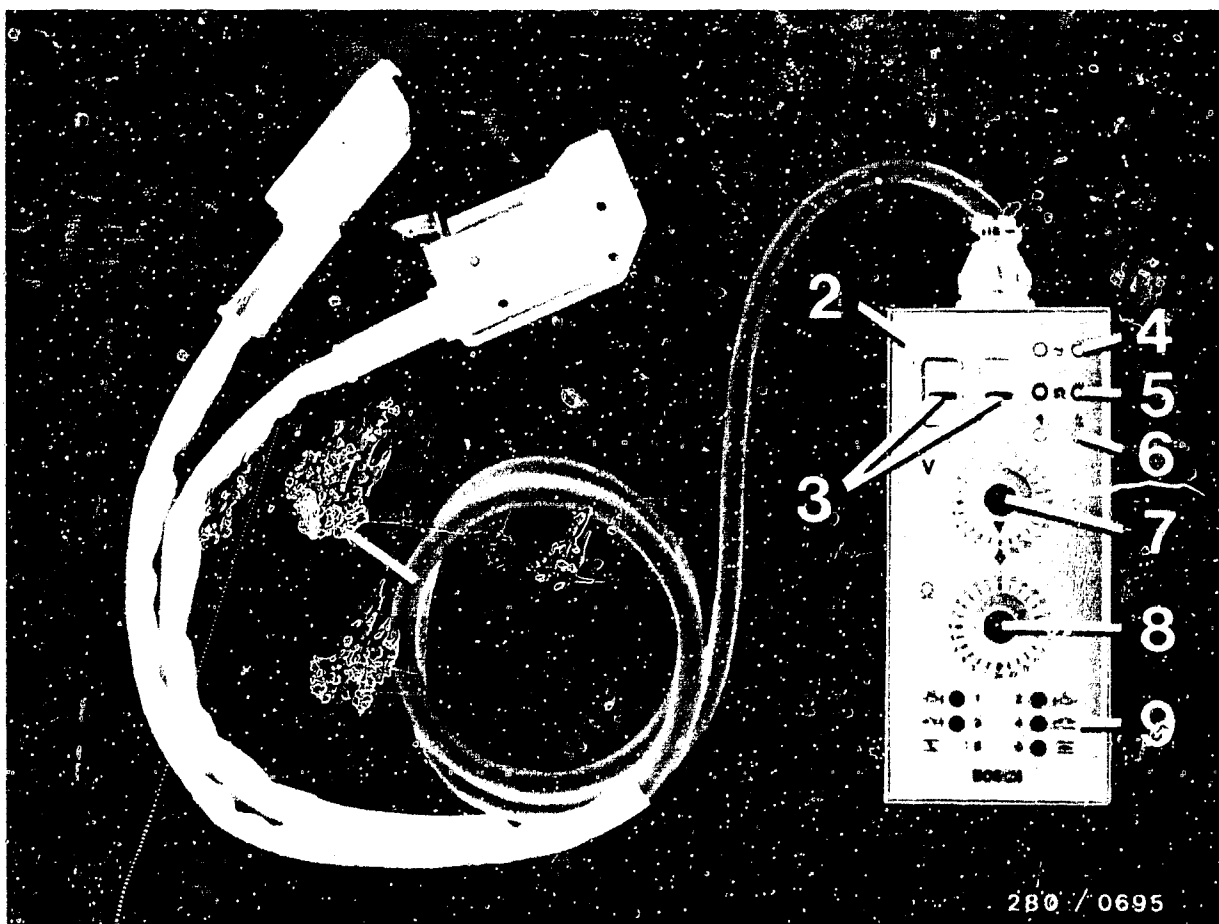
Render the air injection system inoperative for checking/adjusting the idle speed and CO (seal outlet of Item 3 (see arrow)).

TEST EQUIPMENT AND TOOLS

<u>Description</u>	<u>Designation</u>	<u>Part No.</u>
● Universal test adapter	ETT 018.01	0 684 101 801
● Adapter lead		1 684 463 141
● Motortester	e.g. MOT 002.00 MOT 300 MOT 400	0 684 000 200 0 684 000 300 0 684 000 400
● Test lead		1 684 463 093
● Exhaust-gas analyzer calibrated	e.g. ETT 008.00 ETT 008.04 ETT 008.05	0 684 100 800 0 684 100 304 0 684 100 805
● Non-return valve for electric fuel pump, parts set		1 587 010 002
● Jetronic case		KDJE K-100
● Pressure tester Pressure tester (no longer available)		KDJE-P 100 KDEP 1034
● Electrics tester or multimeter e.g.	ETE 014.00 Philips Miselco Fluke	0 684 101 400 PM 2517 X Master 50K Multimeter 75
● Hexagon wrench for CO adjustment (ball screwdriver) AF3 Porsche	9187	Porsche Part No. 000 721 918 70
● Solenoid-operated injection valve		0 280 150 252
● Parts set		0 287 010 701

Use suitable commercially available tools for fitting and removing the idle CO anti-tamper device on the air-mass sensor.





● Universal test adapter with adapter lead for L-Jetronic (version LH)

- 1 = Adapter lead (Part No.: 1 684 463 141)
- 2 = Universal test adapter (Part No.: 0 680 101 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (for voltage measurement)
- 5 = Test sockets (for resistance measurement)
- 6 = Test sockets (for dwell angle tester)
- 7 = Program switch "V"
- 8 = Program switch "Ω"
- 9 = Button panel
 - Buttons 1 and 2: Temperature sensor cold and warm
 - Buttons 3 and 4: Buttons for ground or voltage supply
 - Buttons 5 and 6: Idle/full-load simulation

Connection

The picture shows the two test set-ups in conjunction with the universal test adapter. From top to bottom.

- Test set-up with a motortester (1) (optional)
 - Test set-up of universal test adapter (8) with LH adapter lead (13)
 - Test set-up with a multimeter (14) (optional).
-
- Connect universal test adapter (8).
 - Connect LH adapter lead (13) to universal test adapter.
 - Disconnect control-unit plug (9) of Jetronic wiring harness from control unit and connect to wiring-harness plug (10) of adapter lead.
 - Connect control-unit plug (11) of adapter lead to control unit (12). (Please follow instructions in the individual test steps).

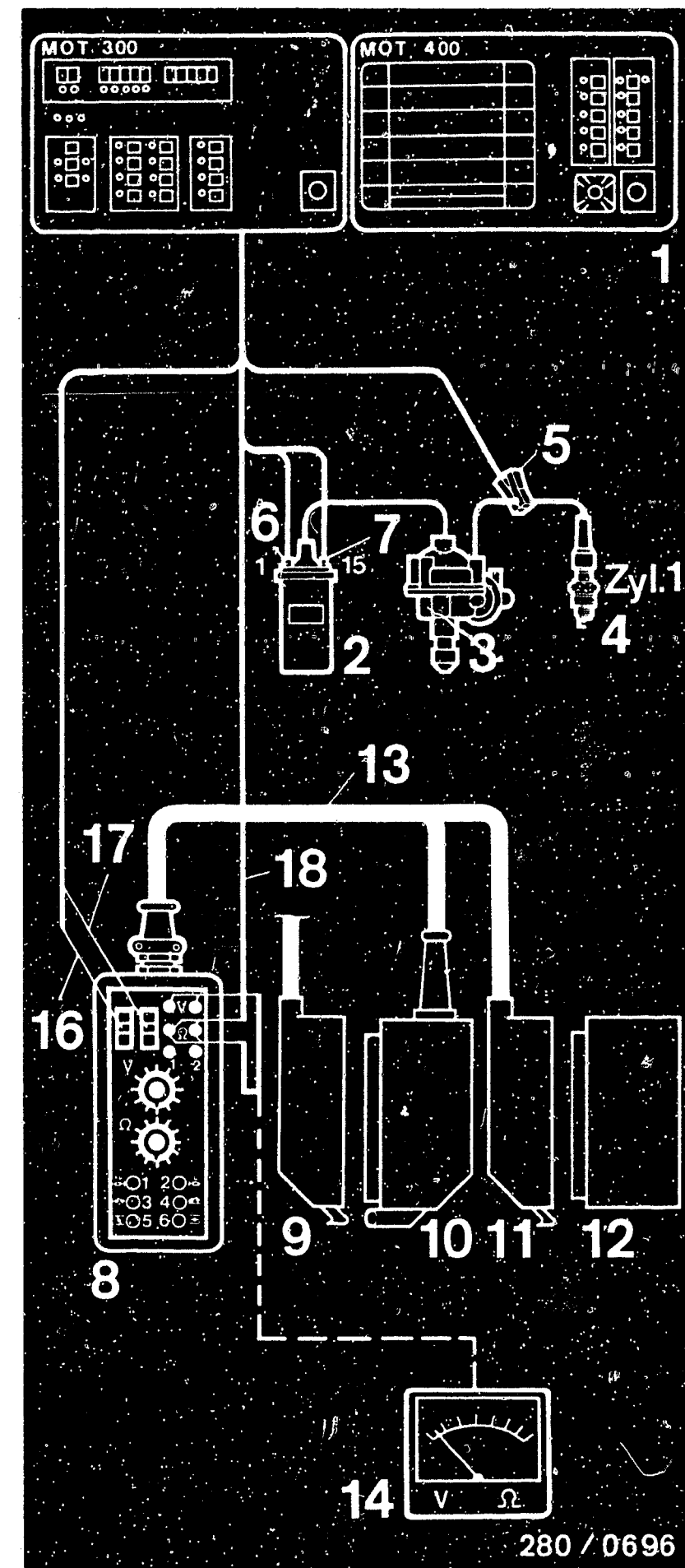
Test set-up for measuring with a motortester (1)

- Inductive clamp-on pickup (5) over ignition cable of cylinder 1 (4) (near distributor) (3).
- Red clamp (16) to red connection terminal
- Black clamp (17) to black connection terminal
- Resistance measuring lead (18) with red and black test prods to blue sockets.

Test set-up for testing with a multimeter (14) with $R_i = \text{min. } 20 \text{ k}\Omega/\text{V}$

- Resistance measurement
Multimeter (14) at setting Ω and plug the measuring lead into the connections for resistance measurement, and plug the measuring leads on the universal test adapter into the blue test sockets.
- Voltage measurement
Multimeter (14) at setting V and plug the measuring leads into the connections for voltage measurement, and plug the measuring leads on the universal test adapter into the red and black test sockets. (Note polarity).

Caution: Connect and disconnect the universal test adapter only with the ignition off.



B3

Test equipment and tools

Porsche 928 S



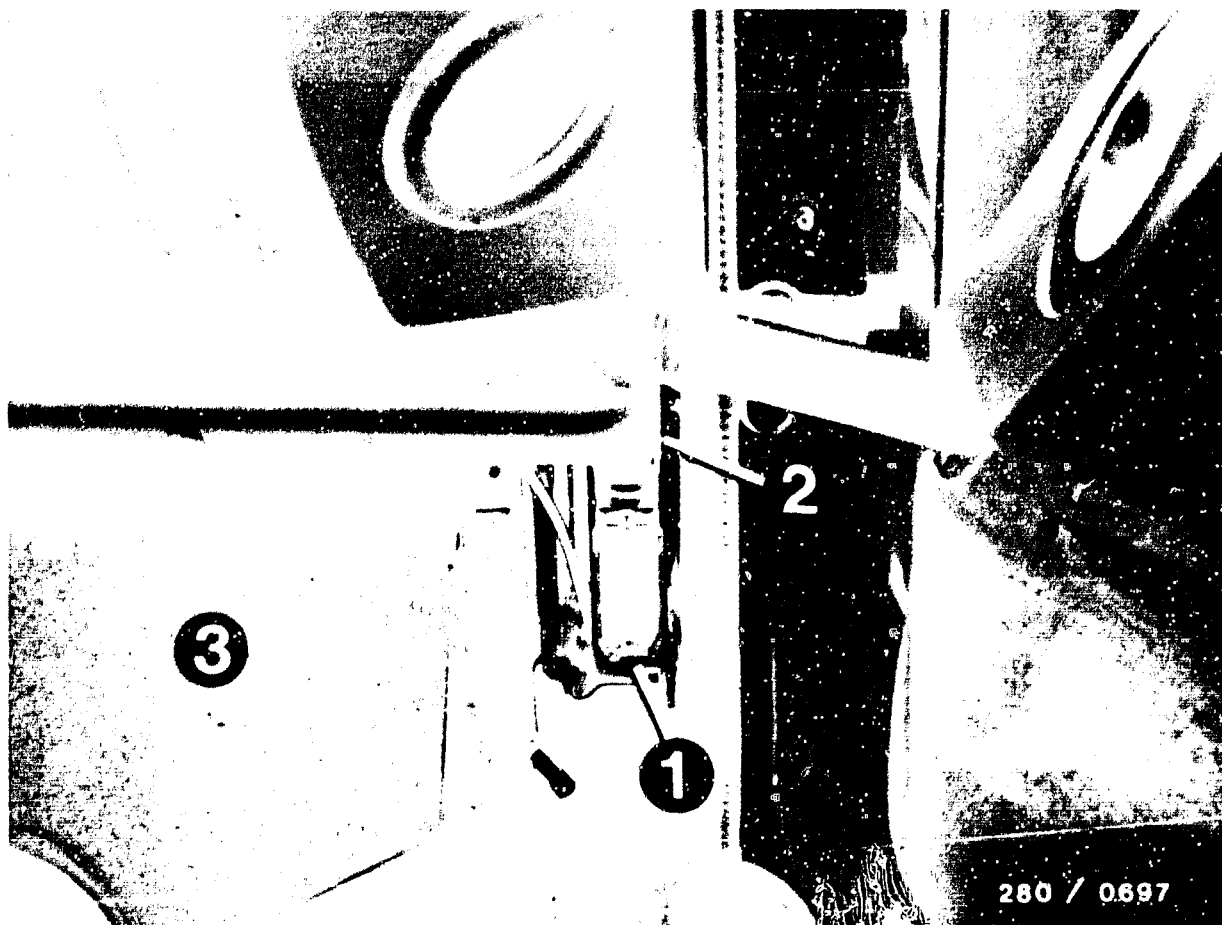
B4

Test equipment and tools

Porsche 928 S



280 / 0696



- 1 = LH control unit
- 2 = Detent
- 3 = Cover

To connect the universal test adapter, disconnect 25-pin control-unit plug. To do this, press detent (2) upward.

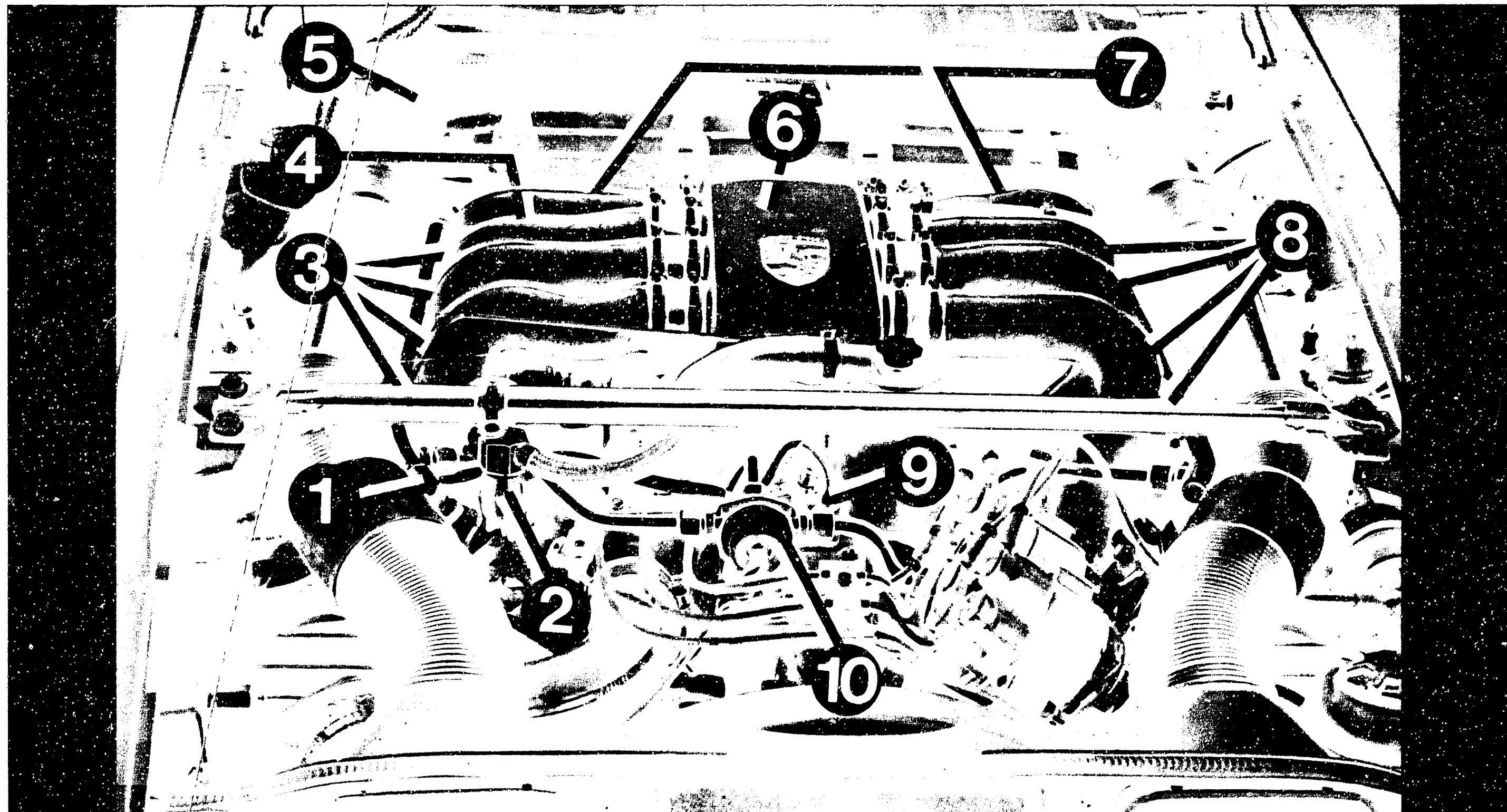
INSTALLATION POSITION OF COMPONENTS

The indications (right) and (left) always refer to the forward direction of travel.

Control unit

The control unit is in the passenger compartment, in the front passenger footwell on the right behind the cover.





Installation position of components (continued)

1 = Test connection for fuel
pressure gauge

2 = Solenoid-operated air valve

3 = Injection valves

4 = Auxiliary-air device

5 = Air filter

6 = Hot-wire air-mass sensor

7 = Pressure regulator

8 = Injection valves

9 = Double temperature sensor

1 x engine temperature - Jetronic

1 x engine temperature - electronic
ignition system

10 = Pressure damper

B6

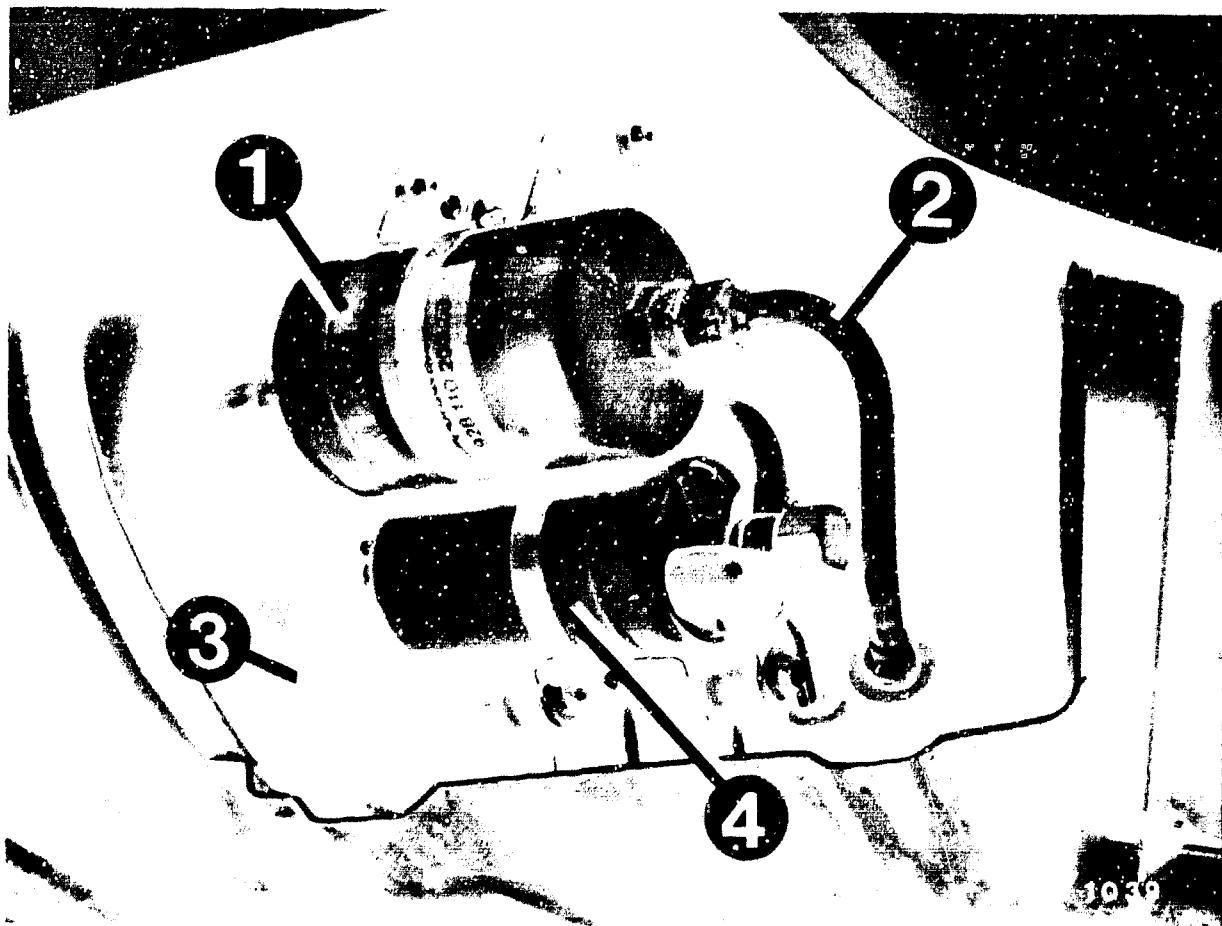
Installation position of components
Porsche 928 S



B7

Installation position of components
Porsche 928 S





- 1 = Fuel filter
- 2 = Fuel delivery line
- 3 = Fuel intake line
- 4 = Electric fuel pump

Installation position of components (continued)



IMPORTANT GENERAL INFORMATION

- Never start engine without securely connected battery.
- Do not use a starting aid with more than 16 V or a fast charger for starting.
- Never disconnect battery from vehicle electrical system with engine running.
- Disconnect battery from vehicle electrical system when fast-charging.
- Remove control unit at temperatures above +80°C (paint-drying installation).
- Make sure that all connectors of wiring harness are securely seated.
- Never connect or disconnect control-unit plug of control unit with ignition on.
- When testing compression, cut the power supply by disconnecting the main relay. This cuts the power supply to the L-Jetronic (LH version) and therefore also to the injection valves. Undesired injecting is thus prevented. Disconnect plugs from ignition trigger boxes.
- Remove LH control unit for electrical welding work (e.g. spot welding).
- When using the following trouble-shooting program, it is assumed that the engine is O.K. and that the ignition is correctly adjusted. The electrical system must be checked and, if necessary repaired.
- In order to be able to carry out the testing operations described in this manual and to assess the components, you should be familiar with the L-Jetronic and how it works. The essential points of the operation and construction of the L-Jetronic are described in Technical Instruction VDT-U 3/3. The LH version is described in Technical Bulletin, New Product VDT-I-280/4 of 10.83 and .. 280/7 of 12.83.
- If an alarm system is installed, proceed according to SIS-ALL-500.



TROUBLE-SHOOTING CHARTS

Using the universal test adapter with adapter lead (1 684 463 141) and other suitable testers, the following trouble-shooting charts are intended to enable the workshop employees to quickly detect causes of trouble on the L-Jetronic (version LH). A choice can be made between the following procedures depending on the level of training and experience of the employee:

- Detailed, step-by-step trouble-shooting chart

For employees with little experience or practice on vehicles equipped with L-Jetronic (version LH2). There is a complete trouble-shooting program for each customer complaint.

B3

- Pin-pointed, direct trouble-shooting chart

For trained and experienced employees with a great deal of practice on vehicles equipped with version LH2.

Trouble-shooting according to customer complaint starts on a specific component within the trouble-shooting program.

B5

Both trouble-shooting charts begin by checking the electrical/electronic part of the LH version with the aid of the universal test adapter with adapter lead. This quickly checks the electrical operation of the wiring harness with the components connected to it, and faults are quickly detected.

If no fault is found with the universal test adapter, it is necessary to perform the fuel pressure test.

If once again no fault is found, continue with the detailed or direct trouble-shooting chart.

C1

Trouble-shooting chart

Porsche 928 S



C2

Trouble-shooting chart

Porsche 928 S



1. Detailed, step-by-step trouble-shooting chart for the complete trouble-shooting program

- Electrical test with universal test adapter, adapter lead 1 684 463 141 and motortester/multimeter
(Coordinates C9...E20)

- Fuel pressure test with pressure gauge

This test must come immediately after the test with the universal test adapter and must be performed from beginning to end (Coordinates F1...F14)

- Trouble-shooting according to customer complaints (fault symptoms)

The table below contains possible fault symptoms and the right-hand column gives the first coordinate of the respective detailed trouble-shooting program.

This trouble-shooting program consists of logically ordered test procedures for all individual components of the LH version. If, after completing the trouble-shooting program for an assumed symptom, the fault has not been detected or remedied, choose a new fault symptom and work through a different program.

<u>Customer complaints (fault symptoms)</u>	<u>Electrical test with universal test adapter</u>	<u>Fuel pressure test with pressure gauge</u>	<u>Trouble-shooting program</u>
1. Starting motor operates, engine fails to start or starts only with great difficulty	C 9	F 1	F 15
2. Engine starts but then dies	C 9	F 1	G 11
3. Rough idle/incorrect idle speed	C 9	F 1	H 1
4. Poor throttle take-up	C 9	F 1	J 5
5. Engine missing under all operating conditions	C 9	F 1	K 1
6. Fuel consumption too high	C 9	F 1	K 21
7. Maximum engine power/top speed not reached	C 9	F 1	L 11
8. Idle speed and CO concentration too low or too high	C 9	F 1	M 1

C3

Trouble-shooting chart

Porsche 928 S



C4

Trouble-shooting chart

Porsche 928 S



2. Pin-pointed, direct trouble-shooting chart, for components within the trouble-shooting programs

- Electrical test with universal test adapter, adapter lead 1 684 463 141 and motortester/multimeter

The test with the universal test adapter must come at the beginning of the test program and must be performed from beginning to end (Coordinates CS...E20).

- Fuel pressure test with pressure gauge

The fuel pressure test must come immediately after the test with the universal test adapter and must be performed from beginning to end (Coordinates F1...F14).

- Trouble-shooting according to customer complaint

The table below contains various fault symptoms with several possible causes of the fault in each case. The reference panel indicates the first coordinate of the test procedure for the respective individual components of the LH version. If, after testing the individual components, the fault has not been detected or remedied, choose a new fault symptom.

Customer complaints (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with great difficulty								
2. Engine starts but then dies								
3. Rough idle/incorrect idle speed								
4. Poor throttle take-up								
5. Engine missing under all operating conditions								
6. Fuel consumption too high								
7. Maximum engine power/top speed not reached								
8. Idle speed and CO concentration too low or too high								
Cause (component fault)								
C9	C9	C9	C9	C9	C9	C9	C9	Fault in electrics; test with universal test adapter
F1	F1	F1	F1	F1	F1	F1	F1	Fault in fuel supply. Pressure regulator defective. Pump relay defective. Pump fuse defective. Poor ground connection of electric fuel pump. Electric fuel pump not operating. Fuel pressure test.
F21	G13		J9					Auxiliary-air device not opening
		H9					M7	Auxiliary-air device not closing
F23	G15		J11	K3	K23	L17	M9	Hot-wire air-mass sensor defective (removal and installation)
	G19						M17	Solenoid-operated injection valves leaking

C5

Trouble-shooting chart

Porsche 928 S



C6

Trouble-shooting chart

Porsche 928 S



Customer complaints (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with great difficulty								
2. Engine starts but then dies								
3. Rough idle/incorrect idle speed								
4. Poor throttle take-up								
5. Engine missing under all operating conditions								
6. Fuel consumption too high								
7. Maximum engine power/top speed not reached								
8. Idle speed and CO concentration too low or too high								
Cause (component fault)								
F17						M13	Cold-start control defective	
G7	G21	H19	J19			L21	M19	Air-intake system leaking
		H15		K17	L7			Injection valves defective; connect test lead (removal and installation)
				K7		L15		Delivery of electric fuel pump too low
		H3	J7	K9				Throttle valve not closing (test overrun cutoff)
						L13		Throttle valves not opening fully
		H3	J7	K9		L13		Throttle-valve switch defective (adjustment)
G3		H5	J15		L3		M3	CO exhaust-gas setting too rich, idle adjustment
G3		H5	J15	K13			M3	CO exhaust-gas setting too lean, idle adjustment, engine coughing
				K9		L13		Control unit defective
		H17						Solenoid-operated air valve defective



TEST CHART FOR UNIVERSAL TEST ADAPTER

with connected adapter lead 1 684 463 141 LH version in the vehicle

Porsche 928 S as of 8.83. and 85 model year (as of 10.84)

- Before testing with the universal test adapter, check all multiple plug connections for loose contacts.
Clean dirty or corroded contacts.
- Watch for receptacle which has been pushed back.
If necessary, bend back locking tab and press receptacle into plug housing as far as it will go. Locking tab latches.
- Suspicion of line breaks in case of kinking and pinching.

Installation position of control unit: Front passenger footwell at bottom right on A-pillar.

The universal test adapter checks the peripherals of the electrics and, by means of a functional test, also the LH control unit. Disconnect control-unit plug of Jetronic wiring harness from control unit and connect to plug of adapter lead. Connect free end of adapter lead to control unit (ignition must be off). Connect a motortester or multimeter for voltage and resistance measurements to the universal test adapter in order to take the measurements.

Caution: Since the adapter lead has to be connected differently for testing the peripherals and for the functional test, follow the instructions in the test chart.

The individual test steps are selected by means of two program switches (one for voltage measurements, the other for resistance measurements). Each program switch has 24 test settings, only some of which, however, are assigned for the LH version.

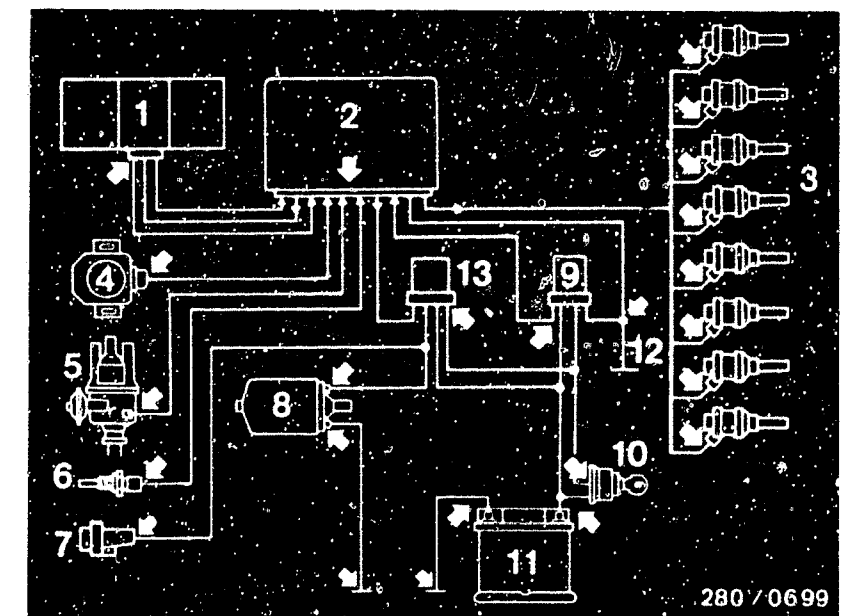
If a fault is found during a test, the test must be repeated after the fault has been remedied.

The test with the universal test adapter must always be performed from beginning to end.

Be sure to follow the instructions in the test chart

- Test steps 1...7 measure resistances. Set motortester/multimeter to "resistance measuring range".
- Test steps 8...13 measure voltages during starting and with ignition "ON".
Set motortester/multimeter to "voltage measuring range".
- Test steps 14...20 are tests with the engine running.

Test specifications and operating instructions for the universal test adapter are given in the following test chart.



Electrical plug-in connections
(arrows)

- 1 = Hot-wire air-mass sensor
- 2 = Control unit
- 3 = Injection valves
- 4 = Throttle-valve switch
- 5 = Ignition distributor
- 6 = Temperature sensor (engine)
- 7 = Auxiliary-air device
- 8 = Electric fuel pump
- 9 = Main relay
- 10 = Ignition lock
- 11 = Battery
- 12 = Central ground
- 13 = Pump relay

C9

Test chart for universal test adapter
Porsche 928 S



C10

Test chart for universal test adapter
Porsche 928 S



Requirements for correct test procedure

1. Start testing with test step 1.
2. The sequence of test steps must be kept to. The trouble-shooting which is given builds on the trouble-shooting for the preceding test steps.

Example:

When in test step 1 the ground connection term. 11 for the control unit is tested, this test is not repeated in the further test steps.

3. If an incorrect reading is indicated for a test step, this test step must be repeated after the fault has been remedied.

Caution:

Test steps 1 to 12: Connect adapter lead to peripherals only.

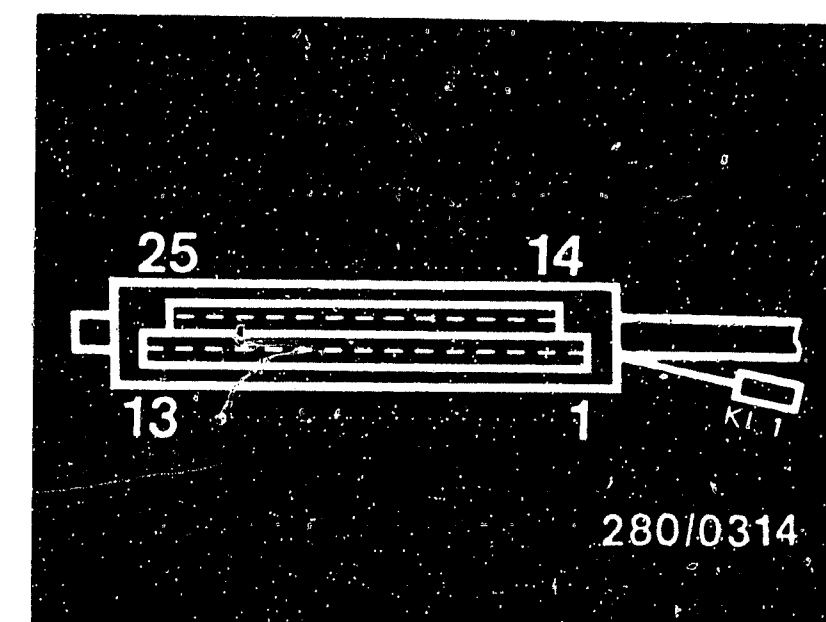
Test steps 13 to 20: Connect adapter lead to control unit and peripherals.

Note:

In the following test steps a white border in the "Operation" column indicates which operation has to be changed in comparison to the preceding test step.



TEST STEP 1 Connect adapter lead to peripherals <u>only</u> .			
Operation		Reading	Testing of peripherals
Program switch "V" at position	↓	Measuring equipment must indicate 1.45...3.3 k Ω at ambient temperature (+15°C...+30°C) and 280...360 Ω with engine at normal op. temp. (+80°C).	Component: Temperature sensor II (engine)
Program switch "Ω" at position	5		
Measuring equipment: Motortester or multimeter			Operation: Resistance between control unit term. 2 and electronics ground terminal
Measuring range: x 10 Ω			Malfunction: Resistance not within tolerance
Connection: Blue test sockets			
Operation in vehicle: --		Yes ↓ Continue testing with next test step.	
		No ↓	



Top view of control-unit plug

Arrow = Temperature sensor II (LH version)

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Measure resistance directly at engine temperature sensor (blue plug).

At ambient temperature (+15°C...+30°C): 1.45...3.3 k Ω

With engine at normal op. temp. (approx. +80°C): 280...360 Ω

Check the following leads for continuity with ohmmeter

(Set value approx. 0 Ω):

- From control-unit plug term. 2 to temperature sensor II (engine) term. 2.
- From control-unit plug term. 11 to electronics ground terminal (on valve cover under blow-off change-over valve).

Eliminate contact resistances in the plug-in connections. Spring contacts must not allow themselves to be pushed back. If the measured resistance is not within tolerance - replace temperature sensor.



C12


Test chart for universal test adapter
Porsche 928 S

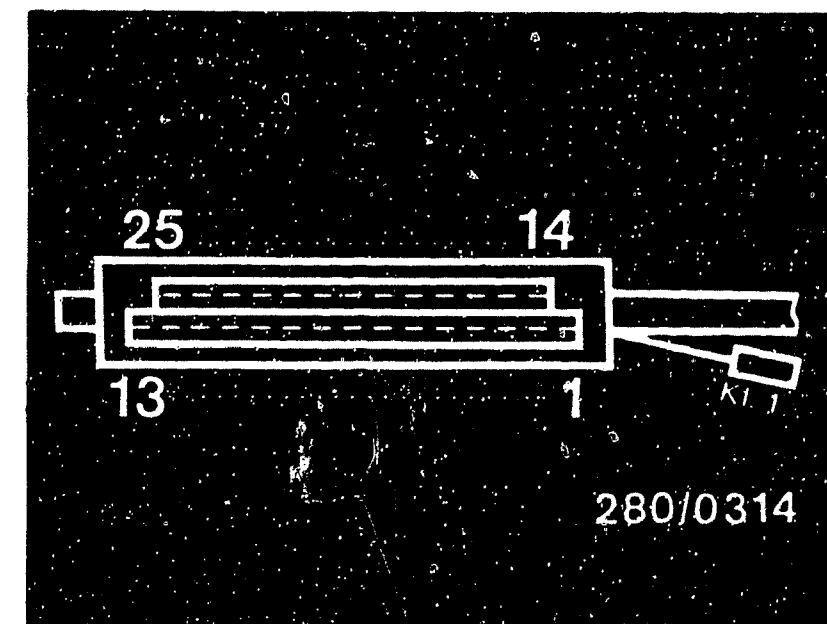


C13

Test chart for universal test adapter
Porsche 928 S

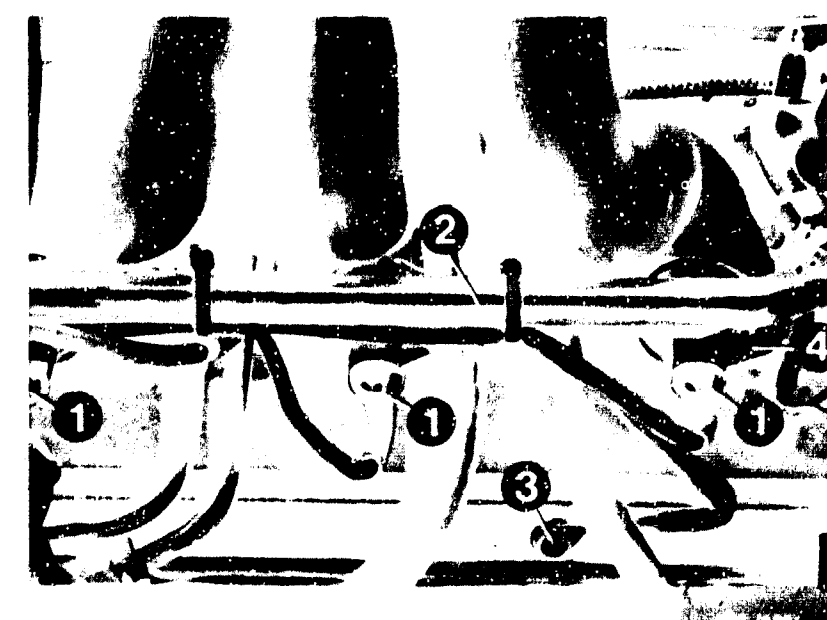


TEST STEP 2 Connect adapter lead to peripherals <u>only</u> .			
<u>Operation</u>		<u>Reading</u>	<u>Testing of peripherals</u>
<u>Program switch "V"</u> at position		<div>Measuring equipment must indicate</div> <div>0...10 Ω.</div> <div></div>	<u>Component:</u> Ground connection of output stage
<u>Program switch "Ω"</u> at position	6		
<u>Measuring equipment:</u> Motortester or multi- meter			<u>Operation:</u> Ground connection of control unit term. 25
<u>Measuring range:</u> x 1 Ω			
<u>Connection:</u> Blue test sockets			
<u>Operation in vehicle:</u> --			
		<div>Yes</div> <div>Continue testing with <u>next test</u> <u>step.</u></div>	<div>No</div> <div>Malfunction:</div> <div>Resistance not within tolerance</div>



Top view of control-unit plug

3 = Output stage ground terminal



Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter
(Set value approx. 0 Ω):

- From control-unit plug term. 25 to output stage ground terminal.
- Loosen ground screws. Clean connection. Re-tighten screw securely afterward.
Eliminate contact resistances at the plug-in connections.

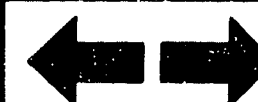
C14

Test chart for universal test adapter
Porsche 928 S

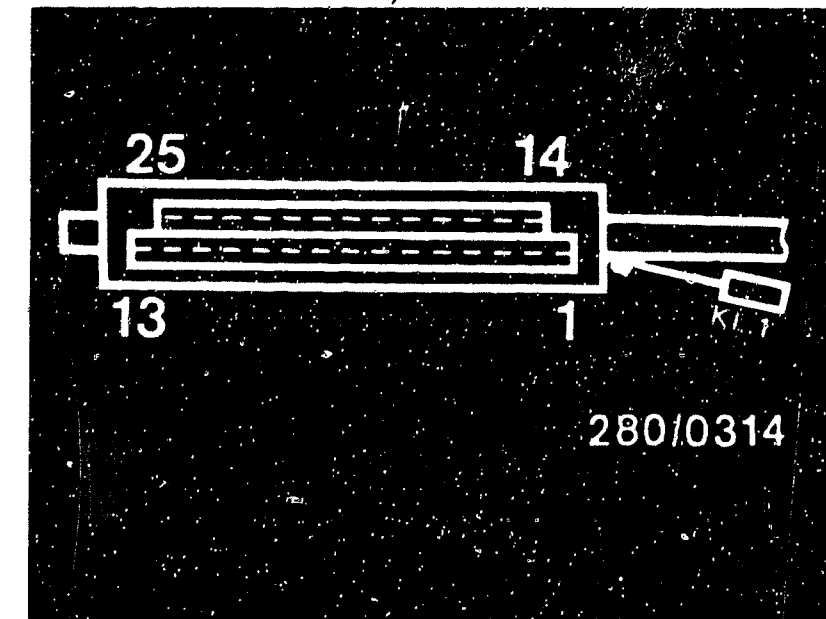


C15

Test chart for universal test adapter
Porsche 928 S

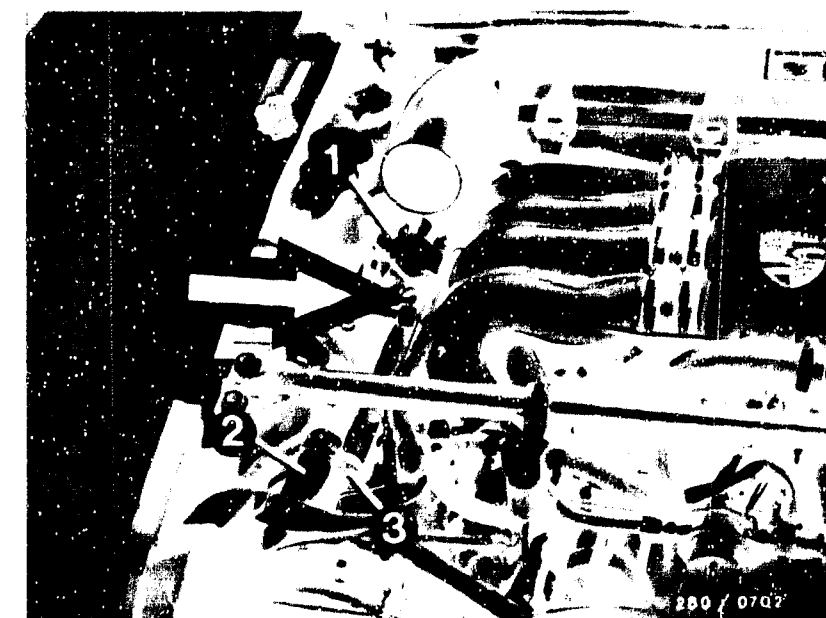



TEST STEP 3 Connect adapter lead to peripherals only.		
Operation	Reading	Testing of peripherals
Program switch "V" at position	<div>Measuring equipment must indicate</div> <div>0...10 Ω.</div> <div>7</div>	<div>Component:</div> <div>Ground connection of electronics ground terminal</div>
Program switch " Ω " at position		
Measuring equipment: Motortester/multimeter		<div>Operation:</div> <div>Ground connection of control unit term. 5</div>
Measuring range: x 1 Ω		
Connection: Blue test sockets	<div>Yes</div> <div>No</div>	<div>Malfunction:</div> <div>Resistance not within tolerance</div>
Operation in vehicle: --		
	Continue testing with next test step.	



Top view of control-unit plug

1 = Blow-off change-over valve
 Arrow = Ground terminal
 Electronics ground terminal



TEST STEP 4 (for vehicles up to 9.84) Connect adapter lead to peripherals <u>only</u> .			
<u>Operation</u>		<u>Reading</u>	<u>Testing of peripherals</u>
<u>Program switch "V" at position</u>		Measuring equipment must indicate 6.00...8.20 Ω at ambient temperature (+15°C...+30°C) and 6.20...8.50 Ω with engine at normal op. temp. (+80°C).	<u>Component:</u> Solenoid-operated injection valves
<u>Program switch "Ω" at position</u>			
<u>Measuring equipment:</u> Motortester/multimeter			<u>Operation:</u> Resistance of all 8 injection valves (in parallel) and elec- tric fuel pump in series with them.
<u>Measuring range:</u> x 1 Ω			
<u>Connection:</u> Blue test sockets			
<u>Operation in vehicle:</u> --			<div>Yes</div> <div>Continue testing with <u>next test</u> step.</div>

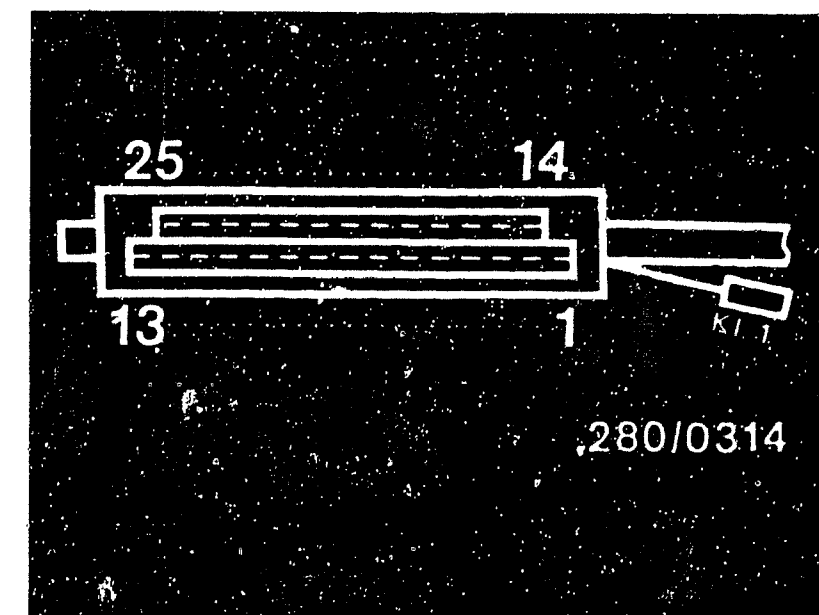
Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

If reading $\infty\Omega$: Pump fuse defective or all injection-valve connectors have open circuit (lead from control unit term. 13 dropped off).

- From control-unit plug term. 13 to the injection valves.
- From the injection valves to central-electrics box plug X terminal number 2.
- From central-electrics box plug X term. no. 2 to pump relay (6) term. 87.
- From pump relay (6) term. 30 to central-electrics box plug V term. no. 4.
- From central-electrics box plug V term. no. 4 to battery term. 30 (positive terminal).
- From pump relay (6) term. 87 to pump fuse (1) no. 13.
- From pump fuse no. 13 to electric fuel pump (positive terminal).
- From electric fuel pump (negative terminal) to ground on bodywork. Ensure good ground connection (behind rear side panelling on right).

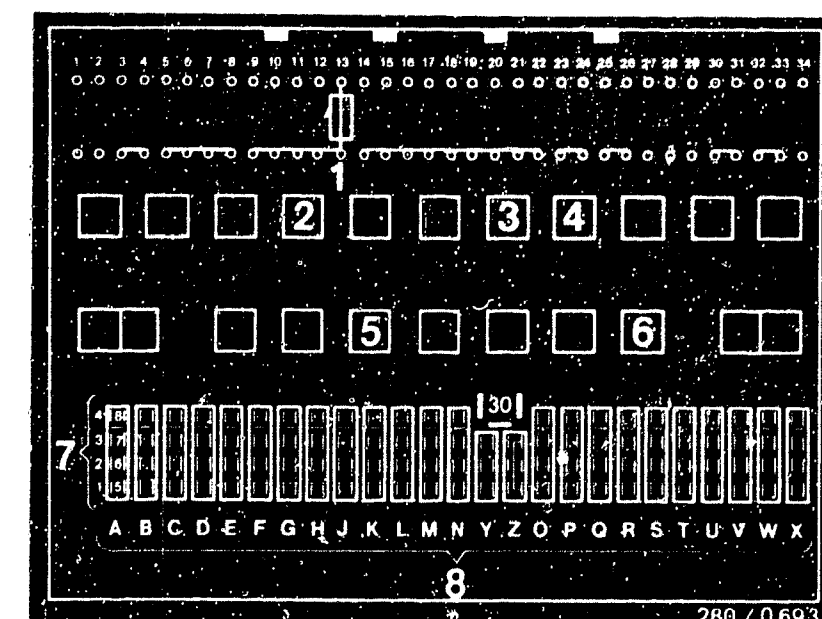
Continued on B20



Top view of control-unit plug

Central electrics box up to 9.84

- 1 = Pump fuse
- 6 = Pump relay
- 8 = Central-electrics box plug



C18

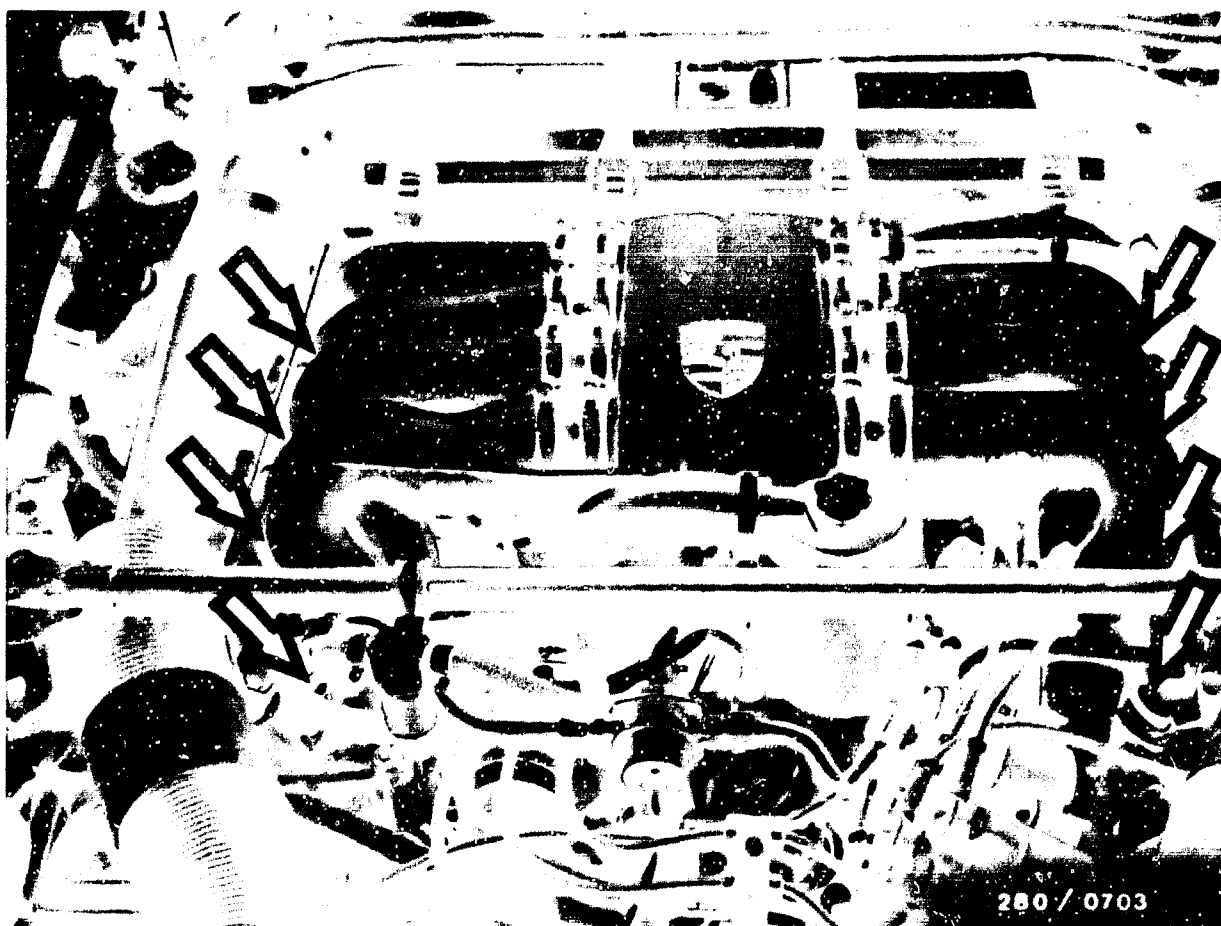
Test chart for universal test adapter
Porsche 928 S



C19

Test chart for universal test adapter
Porsche 928 S





Arrows = Solenoid-operated injection valves

Trouble-shooting - TEST STEP 4 (continued)

Resistance measurement at injection valve:

At ambient temperature (+15°C...+30°C): 15...17.5 Ω

With engine at normal op. temp. (approx. +80°C):
17...20 Ω

If reading too high: Valve coil has open circuit or a valve connector has dropped off.

Check seating of plug-in tabs.

Spring contacts must not allow themselves to be pushed back.

Installation position of components:

Electric fuel pump: Rear right, under a panel.



TEST STEP 4 (For vehicles as of 10.84) Connect adapter lead to peripherals <u>only</u> .			
Operation		Reading	Testing of peripherals
Program switch "V" at position	↓	Measuring equipment must indicate $6.00...8.20\ \Omega$ at ambient temperature (+15°C...+30°C) and $6.20...8.50\ \Omega$ with engine at normal op. temp. (+80°C).	Component: Solenoid-operated injection valves
Program switch "Ω" at position	8		Operation: Resistance of all 8 injection valves (in parallel) and electric fuel pump in series with them.
Measuring equipment: Motor-tester/multimeter			
Measuring range: $\times 1\ \Omega$			
Connection: Blue test sockets		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes Continue test- ing with <u>next</u> test step </div> <div style="text-align: center;"> no ↓ </div> </div>	Malfunction: Resistance not within tolerance
Operation in vehicle: --			

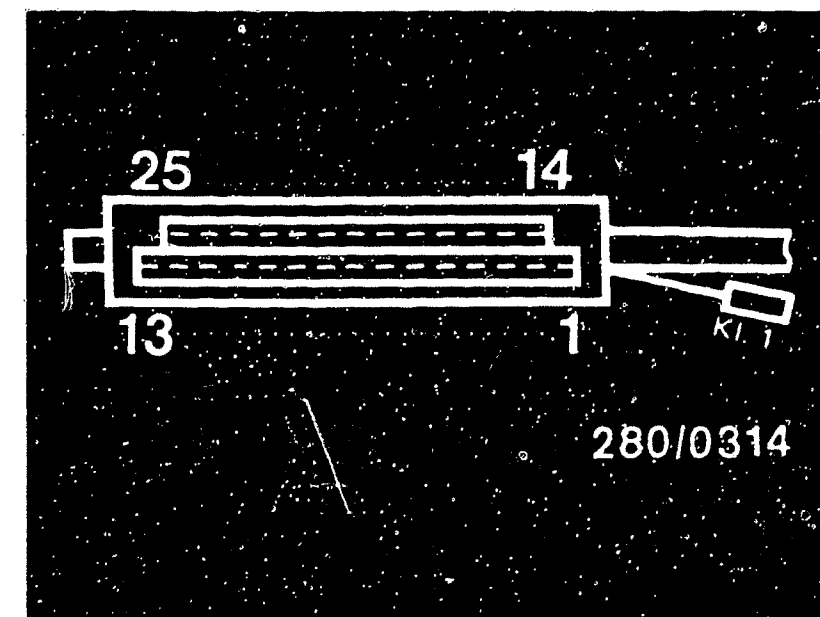
Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

If reading $\infty\ \Omega$: Pump fuse defective or all injection-valve connectors have open circuit (lead from control unit term. 13 dropped off).

- From control-unit plug term. 13 to the injection valves.
- From injection valves to central-electrics box plug W terminal number 13.
- From central-electrics box plug W term. no. 13 to pump relay (6) term. 87.
- From pump relay (6) term. 30 to central-electrics box plug U term. no. 12.
- From central-electrics box plug U term. no. 12 to battery term. 30 (positive terminal).
- From pump relay (6) term. 87 to pump fuse (1) no. 42.
- From pump fuse no. 42 to electric fuel pump (positive terminal).
- From electric fuel pump (negative terminal) to ground on body. Ensure good ground connection (behind rear side panelling on right).

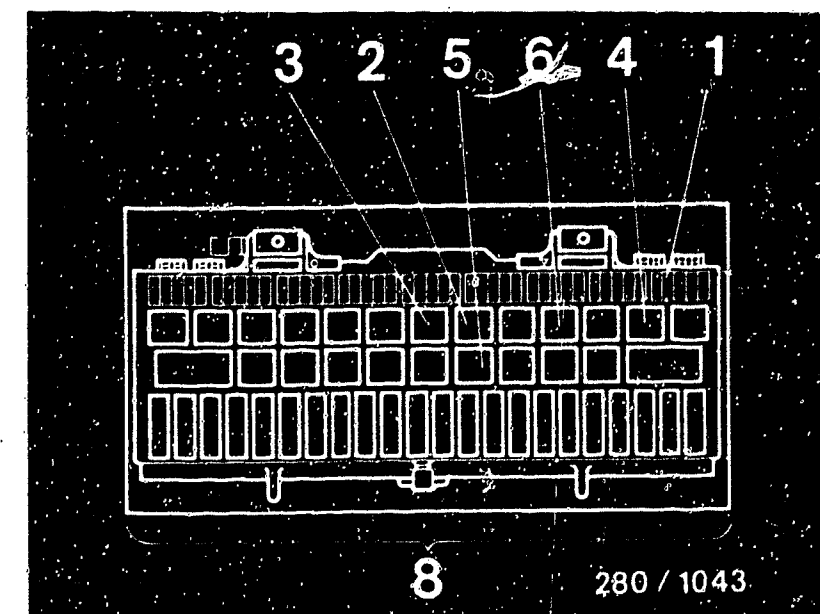
Continued on C23



Top view of control-unit plug

Central-electrics box (as of 10.84)

- 1 = Pump fuse
- 2 = Pump relay
- 8 = Central-electrics box plug



C21

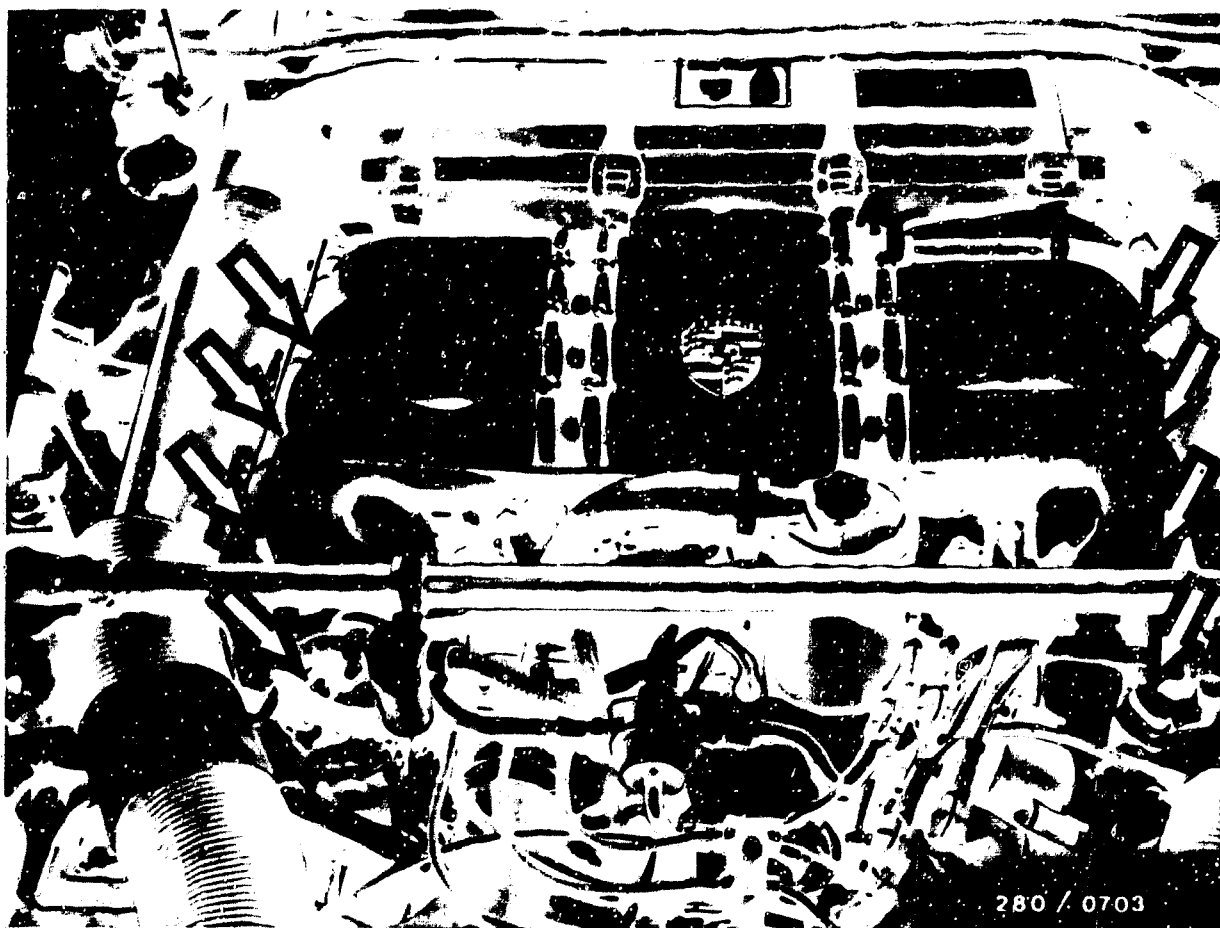
Test chart for universal test adapter
Porsche 928 S



C22

Test chart for universal test adapter
Porsche 928 S





Arrows = Solenoid-operated injection valves

Trouble-shooting - TEST STEP 4 (continued)

Resistance measurement at injection valve:

At ambient temperature (+15°C...+30°C): 15...17.5 Ω

With engine at normal op. temp. (approx. +80°C):
17...20 Ω

If reading too high: Valve coil has open circuit or a valve connector has dropped off.

Further sources of trouble: Auxiliary-air device with plug-in connection Q 14.

Check seating of plug-in tabs.

Spring contacts must not allow themselves to be pushed back.

Installation position of components:

Electric fuel pump: Rear right, under a panel.



TEST STEP 5 Connect adapter lead to peripherals <u>only</u> .			
<u>Operation</u>		<u>Reading</u>	<u>Testing of peripherals</u>
<u>Program switch "V"</u> at position	↓	Measuring equipment must indicate <u>0...10 Ω.</u>	<u>Component:</u> Throttle-valve switch (idle contact)
<u>Program switch "Ω"</u> at position	9		<u>Operation:</u> Resistance Control-unit plug term. 3 to electronics ground terminal.
<u>Measuring equipment:</u> Motor- tester/multimeter			
<u>Measuring range:</u> x 1 Ω		Yes ↓ No ↓	<u>Malfunction:</u> Resistance not within tolerance
<u>Connection:</u> Blue test sockets			
<u>Operation in vehicle:</u> Accelerator in rest position			

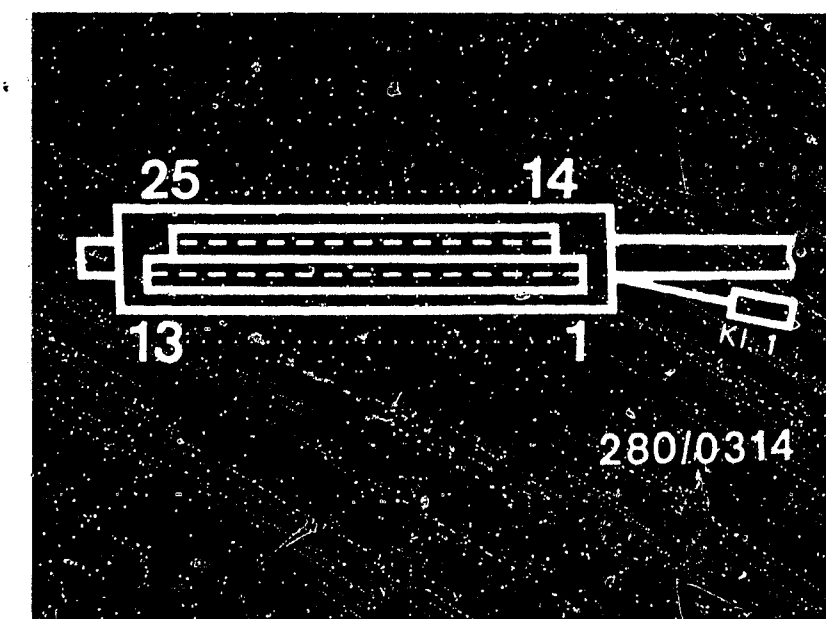
Trouble-shooting:
For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Adjusting the throttle-valve switch:
Slightly loosen throttle-valve switch fastening screws. Connect ohmmeter to throttle-valve switch between term. 2 and term. 18. Turn throttle-valve switch slightly to the right. Then to the left until the idle contact closes (microswitch clicks audibly). Reading approx. 0 Ω . Re-tighten fastening screws. If reading incorrect, replace throttle-valve switch.

Checking the adjustment: Pull slightly on throttle cable. The idle contact opens (microswitch clicks audibly). Reading $\infty\Omega$.

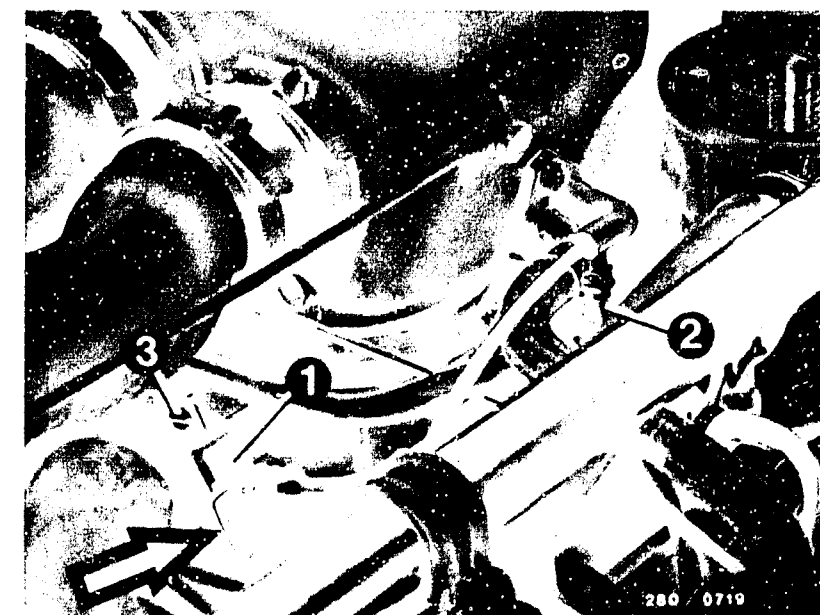
Check the following leads for continuity with ohmmeter
(Set value approx. 0 Ω):

- From control-unit plug term. 3 to throttle-valve switch term. 2.
- From throttle-valve switch term. 18 (lead 48) to electronics ground terminal.
- Spring contacts must not allow themselves to be pushed back.
- Eliminate contact resistances in the plug-in connections.



Top view of control-unit plug

1 = Throttle-valve switch



D1

Test chart for universal test adapter
Porsche 928 S

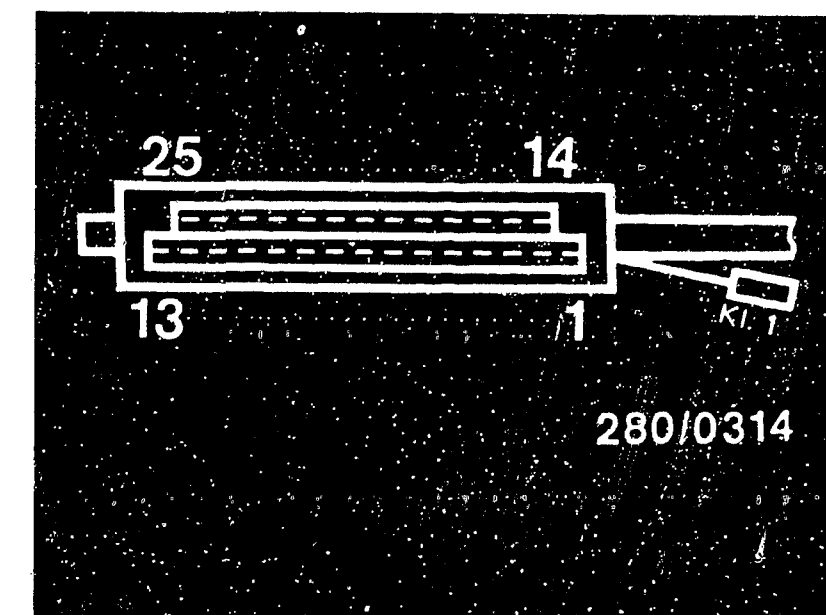


D2

Test chart for universal test adapter
Porsche 928 S

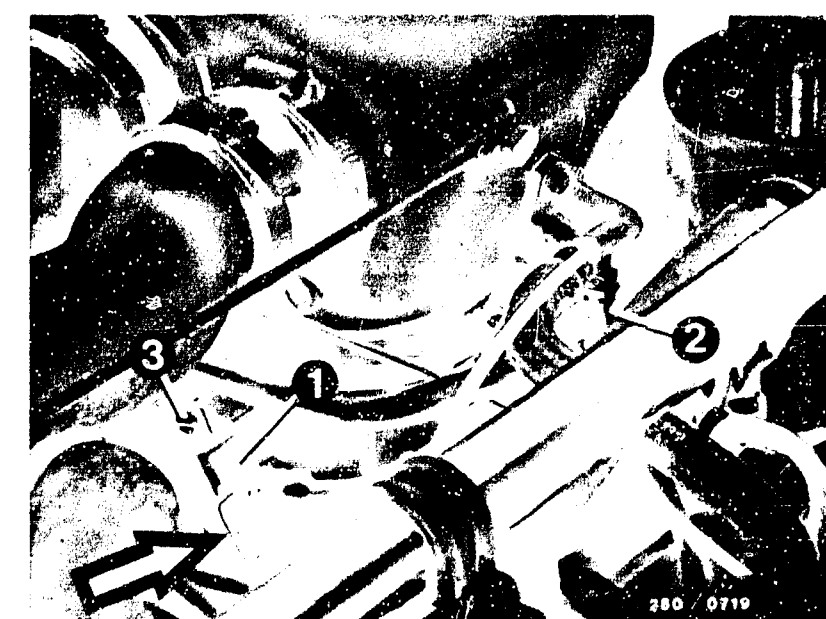


TEST STEP 6 Connect adapter lead to peripherals <u>only</u> .			
Operation		Reading	Testing of peripherals
Program switch "V" at position	↓	Measuring equipment must indicate 0...10 Ω.	Component: Throttle-valve switch (full-load contact)
Program switch "Ω" at position	10		
Measuring equipment: Motor-tester/multimeter			Operation: Resistance at control-unit plug term. 12 to electronics ground terminal.
Measuring range: x 1 Ω			
Connection: Blue test sockets			
Operation in vehicle: Accelerator in full-load position (pressed all the way down)		<div>Yes</div> <div>Continue testing with next test step.</div> <div>No</div>	Malfunction: Resistance not within tolerance



Top view of control-unit plug

1 = Throttle-valve switch



Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter
(Set value approx. 0 Ω):

- From control-unit plug term. 12 to throttle-valve switch term. 3
- From throttle-valve switch term. 18 (lead 48) to electronics ground terminal.

Eliminate contact resistances in the plug-in connections.

- Spring contacts must not allow themselves to be pushed back.

Installation position of components

Electronics ground terminal: On right-hand valve cover under blow-off change-over valve.

D3


Test chart for universal test adapter
Porsche 928 S

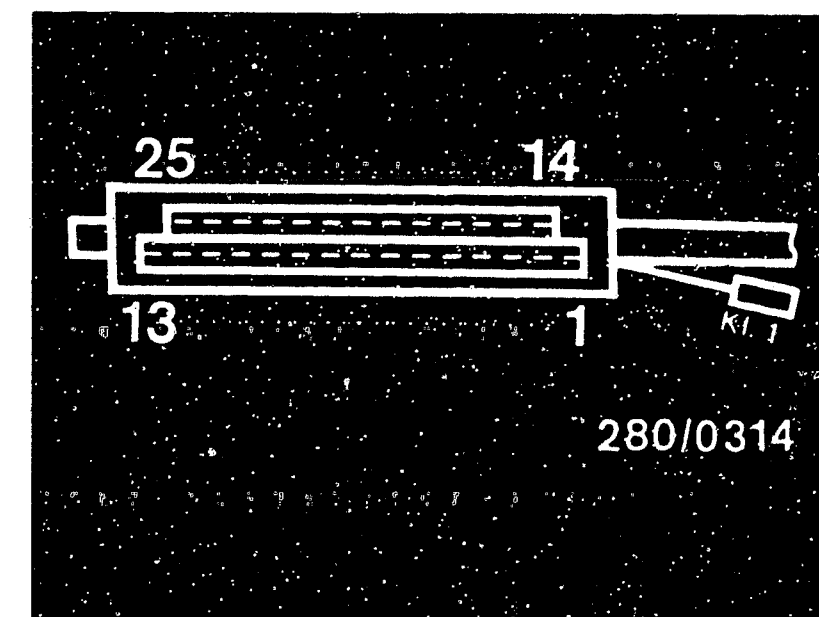


D4

Test chart for universal test adapter
Porsche 928 S

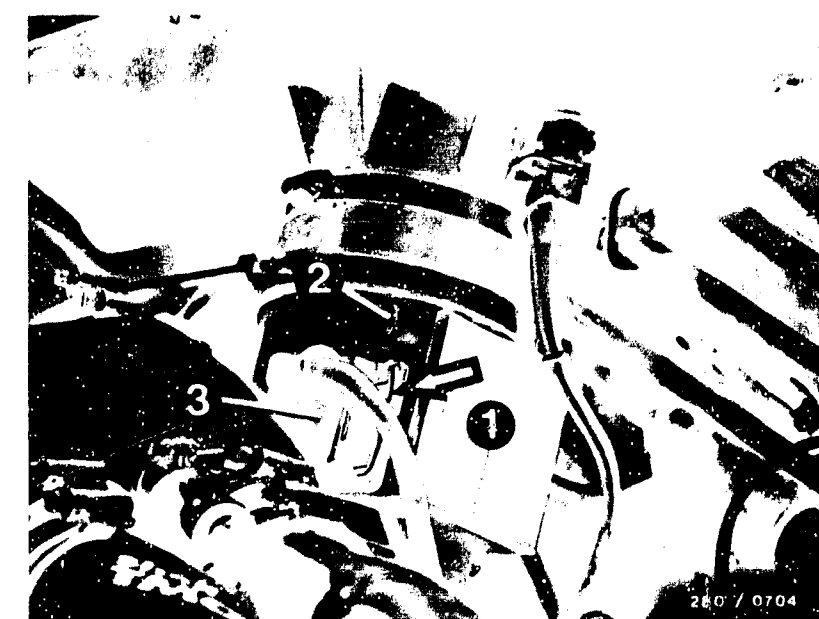


TEST STEP 7 Connect adapter lead to peripherals <u>only</u> .			
Operation		Reading	Testing of peripherals
<u>Program switch "V"</u> <u>at position</u>		Measuring equipment must indicate	<u>Component:</u> Potentiometer in hot-wire air-mass sensor
<u>Program switch "Ω"</u> <u>at position</u>	21	150...600 Ω.	
<u>Measuring equipment:</u> Motor- tester/multimeter		<div><div>Yes</div><div>↓</div><div>Continue testing with next test step.</div></div> <div><div>No</div><div>↓</div><div></div></div>	<u>Operation:</u> Potentiometer for idle- mixture adjustment (term. 6 and term. 3 on hot-wire air-mass sensor)
<u>Measuring range:</u> x 10 Ω			
<u>Connection:</u> Blue test sockets			
<u>Operation in vehicle:</u> --			<u>Malfunction:</u> Resistance not within tolerance



Top view of control-unit plug

- 1 = Hot-wire air-mass sensor
 - 2 = Potentiometer for idle-mixture adjustment
 - 3 = Plug
- When disconnecting plug, press retainer in direction of arrow)



Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter

(Set value approx. 0 Ω):

- From control-unit plug term. 14 to hot-wire air-mass sensor term. 6.
- From hot-wire air-mass sensor term. 3 to control-unit plug term. 6.

Measure resistance directly at hot-wire air-mass sensor between term. 6 and term. 3.
Set value 150...600 Ω..

Adjust resistance to 370...390 Ω.

If not adjustable, replace hot-wire air-mass sensor.

If adjustable, CO adjustment must be checked.

Eliminate contact resistances in the plug-in connections.

Spring contacts must not allow themselves to be pushed back.

D5

Test chart for universal test adapter
Porsche 928 S



D6

Test chart for universal test adapter
Porsche 928 S



TEST STEP 8 (for vehicles up to 9.84) Connect adapter lead to peripherals <u>only</u> .			
Operation		Reading	Testing of peripherals
Program switch "V" at position	4	Measuring equipment must indicate 8...15 V.	Component: Starting motor
Program switch "Ω" at position	21		
Measuring equipment: Motor-tester/multimeter			Operation: Starting signal from term. 50 on control-unit plug term. 4
Measuring range: 15 V			
Connection: Red test socket/well = pos. Black test socket/well = ground		Yes ↓ Continue testing with next test step.	Malfunction: No voltage reading
Operation in vehicle: Shift gear to neutral, start		No ↓	

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

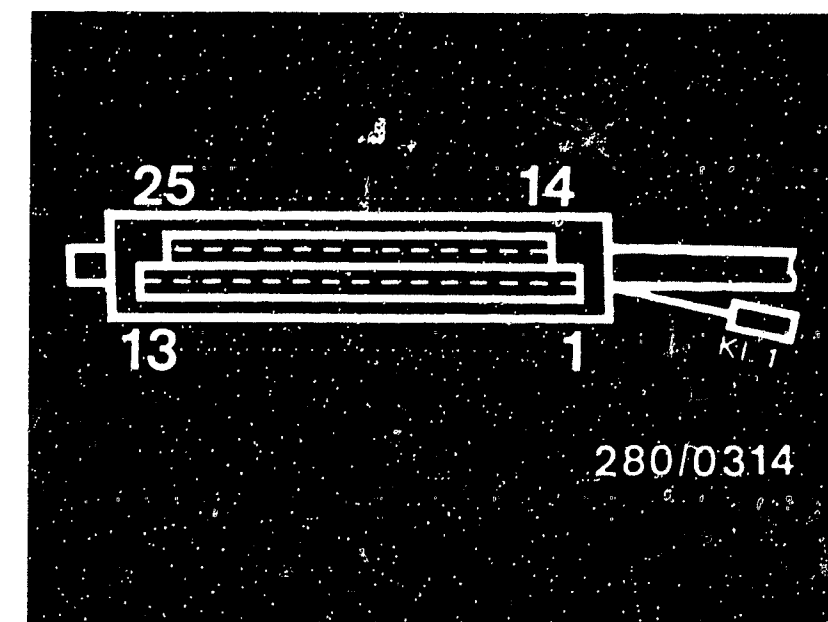
Check the following leads for continuity with ohmmeter
(Set value approx. 0 Ω)

- From control-unit plug term. 4 to central-electrics box plug X term. no. 7.
- From central-electrics box plug X term. no. 7 to central-electrics box plug W term. no. 7.
- From central-electrics box plug W term. no. 7 to central-electrics box plug O term. no. 5.
- From central-electrics box plug O term. no. 5 to starting relay (3) term. 87.
- From central-electrics box plug O term. no. 5 through a plug-in connection to starting motor term. 50.

Eliminate contact resistances in the plug-in connections.

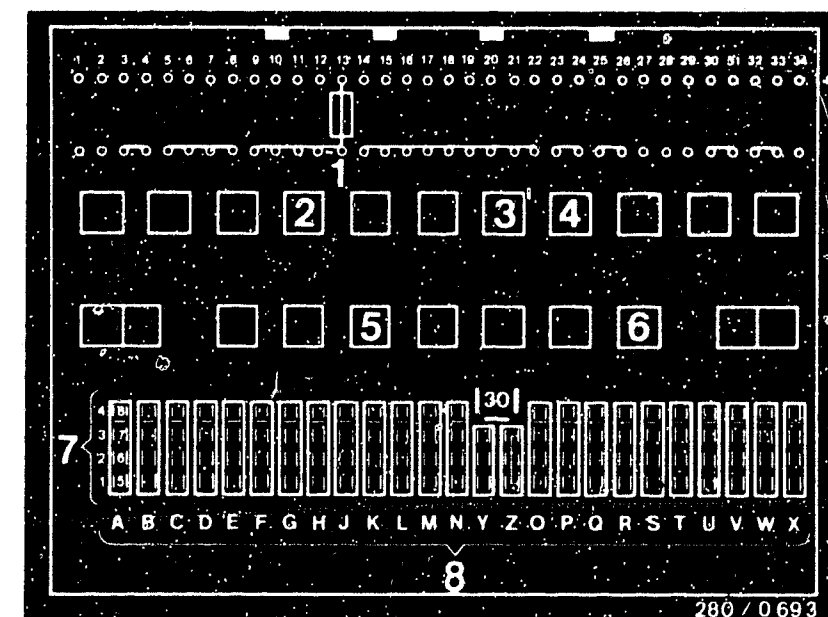
If still no voltage reading - check starting equipment.

Spring contacts must not allow themselves to be pushed back.



Top view of control-unit plug

Central-electrics box (up to 9.84)
3 = Starting relay
8 = Central-electrics box plug



D7

Test chart for universal test adapter
Porsche 928 S

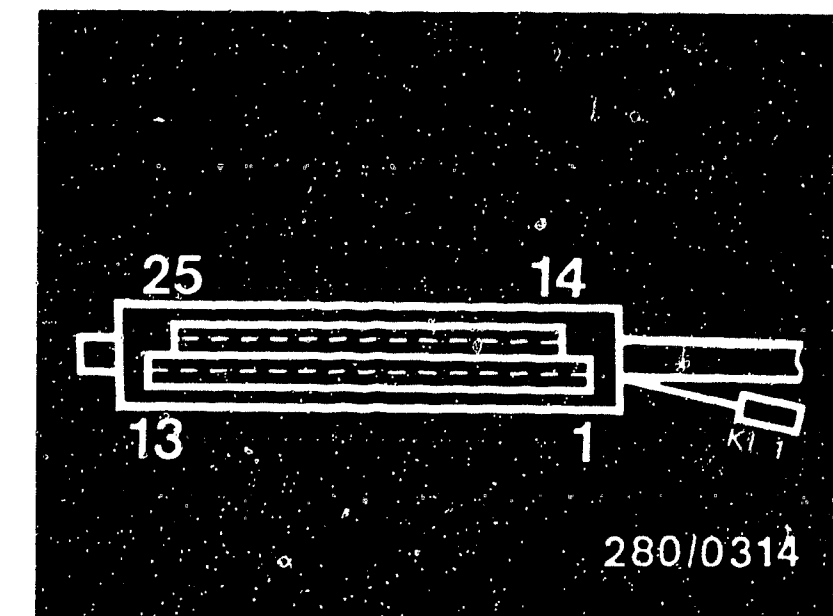


D8

Test chart for universal test adapter
Porsche 928 S

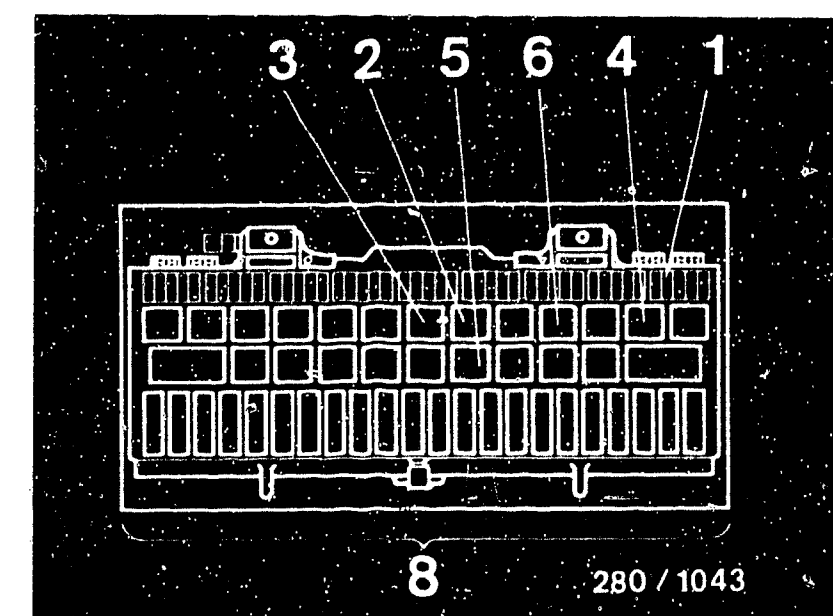


TEST STEP 8 (for vehicles as of 10.84) Connect adapter lead to peripherals <u>only</u> .			
<u>Operation</u>		<u>Reading</u>	<u>Testing of peripherals</u>
<u>Program switch "V" at position</u>	4	Measuring equipment must indicate <u>8...15 V.</u>	<u>Component:</u> Starting motor
<u>Program switch "Ω" at position</u>	21		
<u>Measuring equipment:</u> Motor-tester/multimeter		<div><div>Yes</div><div>↓</div><div>Continue test- ing with <u>next</u> test step.</div></div> <div><div>No</div><div>↓</div></div>	<u>Operation:</u> Starting signal from term. 50 on control-unit plug term. 4
<u>Measuring range:</u> 15 V			
<u>Connection:</u> Red test socket/well = pos. Black test socket/well = ground			
<u>Operation in vehicle:</u> Shift gear to neutral, start			
			<u>Malfunction:</u> No voltage reading



Top view of control-unit plug

Central-electrics box (as of 10.84)
 3 = Starting relay
 8 = Central-electrics box plug



Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter
 (Set value approx. 0 Ω)

- From control-unit plug term. 4 to central-electrics box plug W term. no. 22.
- From central-electrics box plug W term. no. 22 to central-electrics box plug Q term no. 13.
- From central-electrics box plug Q term. no. 13 through a plug-in connection to starting motor term. 50. If necessary, check starting motor.
- From central-electrics box plug W term. no. 22 to starting relay (3) term. 87.

Eliminate contact resistances in the plug-in connections.
 If still no voltage reading - check starting equipment.
 Spring contacts must not allow themselves to be pushed back.

D9

Test chart for universal test adapter
 Porsche 928 S



D10

Test chart for universal test adapter
 Porsche 928 S



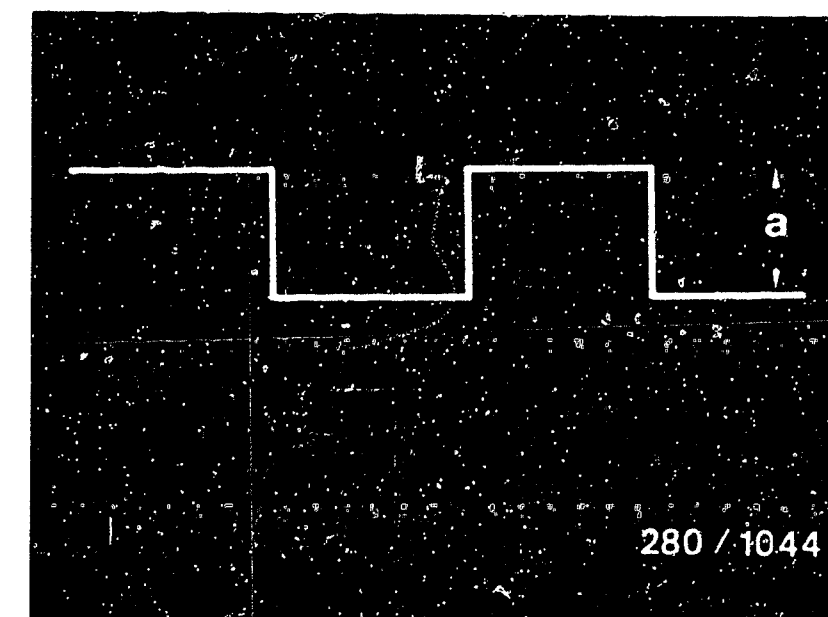
TEST STEP 9 Connect adapter lead to peripherals only.

Operation		Reading	Testing of peripherals
<u>Program switch "V" at position</u>	5	t_n signal present (See top diagram)	<u>Component:</u> Ignition coils, ignition cables, ignition trigger boxes, electronic ignition control unit
<u>Program switch "Ω" at position</u>	21		
<u>Measuring equipment:</u> Motor-tester with oscilloscope			
<u>Measuring range:</u> Special input Setting % and 10 V (if present)		<div><div>Yes</div><div>Continue test- ing with <u>next</u> test step</div></div> <div><div>No</div><div></div></div>	<u>Operation:</u> t_n signal from electronic ignition control unit term. 16 to LH control unit term. 1
<u>Connection:</u> Test wells. Red clip to red well, black clip to black well. Clamp-on trigger pickup to cylinder 1.			
<u>Operation in vehicle:</u> Ignition "ON". Shift gear to neutral and start.			
			<u>Malfunction:</u> No signal or signal incorrect

Trouble-shooting:

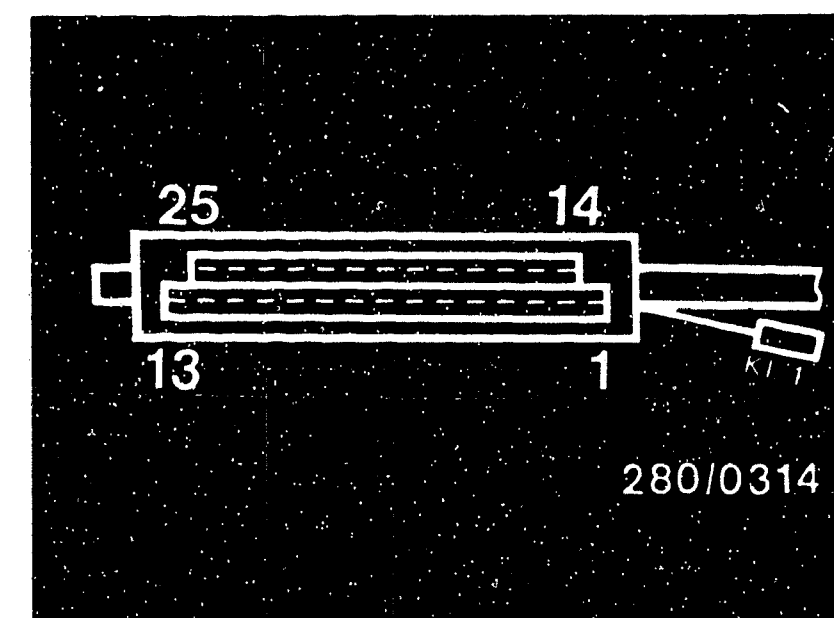
For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Continued on D13/D14



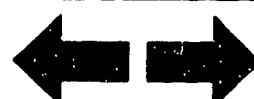
t_n signal
a = approx. 10.0...11.0 V

Top view of control-unit plug



D11

Test chart for universal test adapter
Porsche 928 S



D12

Test chart for universal test adapter
Porsche 928 S



Trouble-shooting - test step 9 (continued)

On vehicles up to 9.84:

Check the following leads for continuity with ohmmeter
(Set value approx. 0 Ω):

- From control-unit plug term. 1 to electronic ignition control-unit plug term. 16.
- From control-unit plug (electronic ignition) term. 16 to central-electrics box plug X term. no. 6.
- From central-electrics box plug X term. no. 6 to kick-down relay (5) term. 31b.
- From kick-down relay term. 31b to tachometer and fuel consumption meter.

On vehicles as of 10.84:

- From control-unit plug term. 1 to electronic ignition control unit term. 16.
- From electronic ignition control-unit plug term. 16 to central-electrics box plug W term. no. 11.
- From central-electrics box plug W term. no. 11 to kick-down relay (5) term. 31b.
- From central-electrics box plug W term. no. 11 to central-electrics box plug J term. no. 11 and on to tachometer.

If fault still present: Clamp trigger pickup onto a different cylinder.

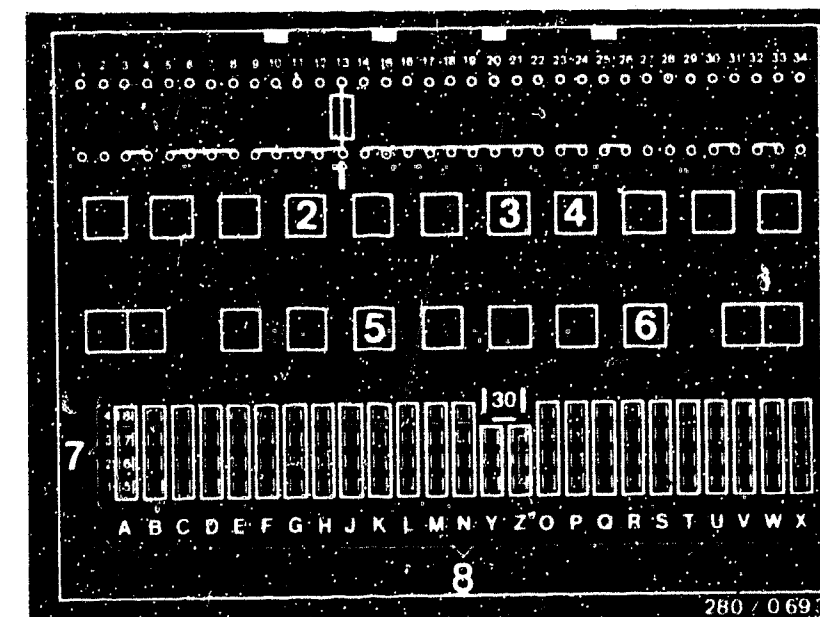
Eliminate contact resistances in the plug-in connections.

Spring contacts must not allow themselves to be pushed back.

If fault cannot be found: Check electronic ignition system.

Installation position of components:

Electronic ignition control unit: In front passenger footwell on right, to left of LH control unit.



Central-electrics box (up to 9.84)

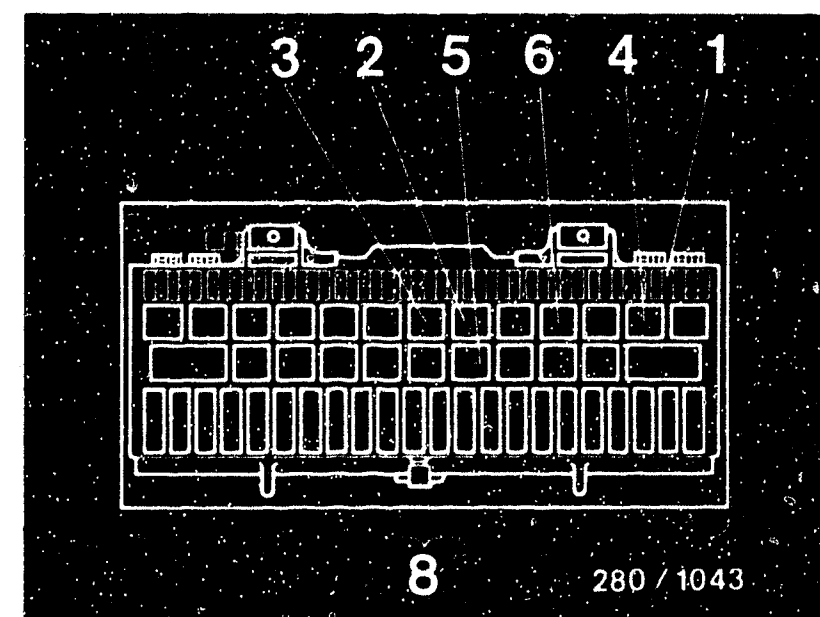
5 = Kick-down relay

8 = Central-electrics box plug

Central-electrics box plug (as of 10.84):

5 = Kick-down relay

8 = Central-electrics box plug



D13

Test chart for universal test adapter
Porsche 928 S

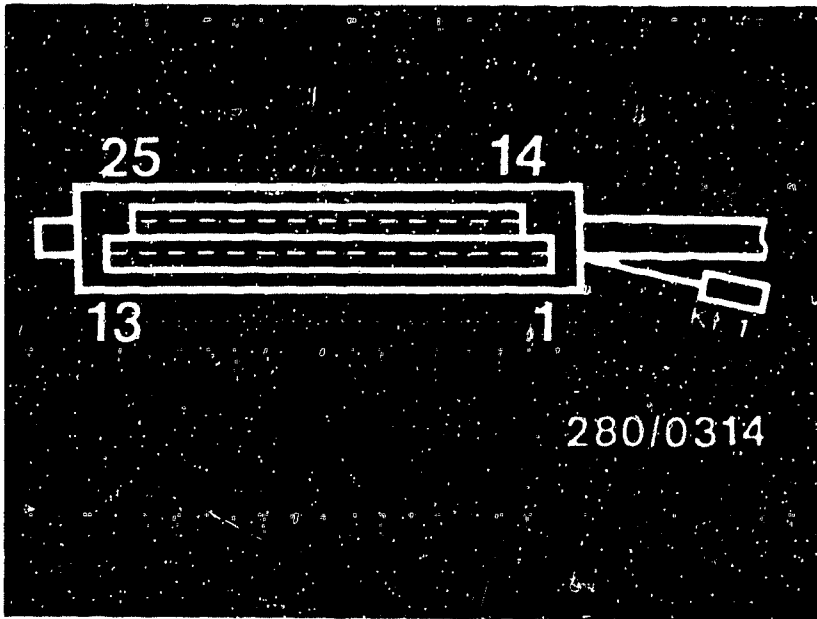


D14

Test chart for universal test adapter
Porsche 928 S

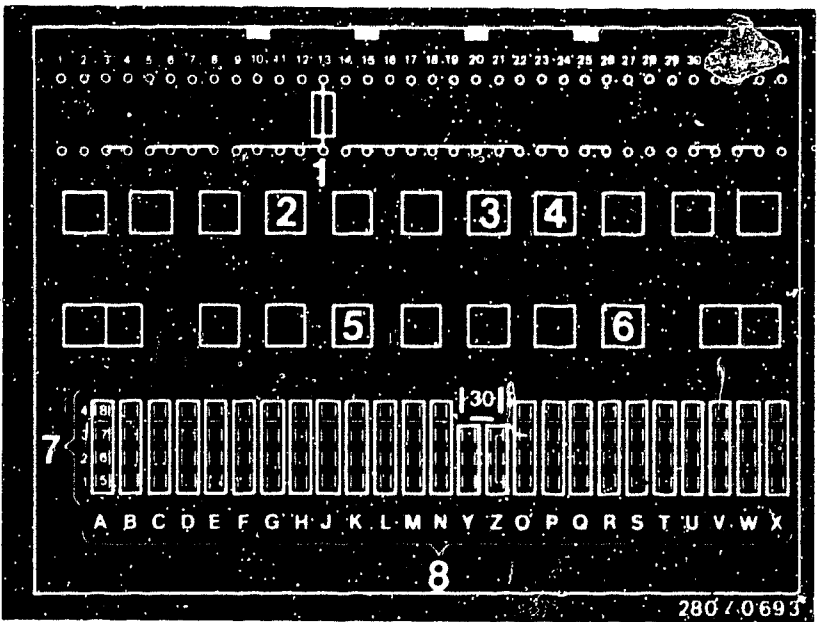


TEST STEP 10 Connect adapter lead to peripherals <u>only</u> .			
Operation		Reading	Testing of peripherals
Program switch "V" at position	6	Measuring equipment must indicate 8...15 V.	Component: Main relay, power supply
Program switch "Ω" at position	21		
Measuring equipment: Motor-tester/multimeter			
Measuring range: 15 V			Operation: Power supply from term. 87/1
Connection: Red test socket/well = pos. Black test socket/well = ground		Yes	Malfunction: No voltage reading
Operation in vehicle: Ignition "ON"		Continue testing with next test step.	
Press button 4		No	

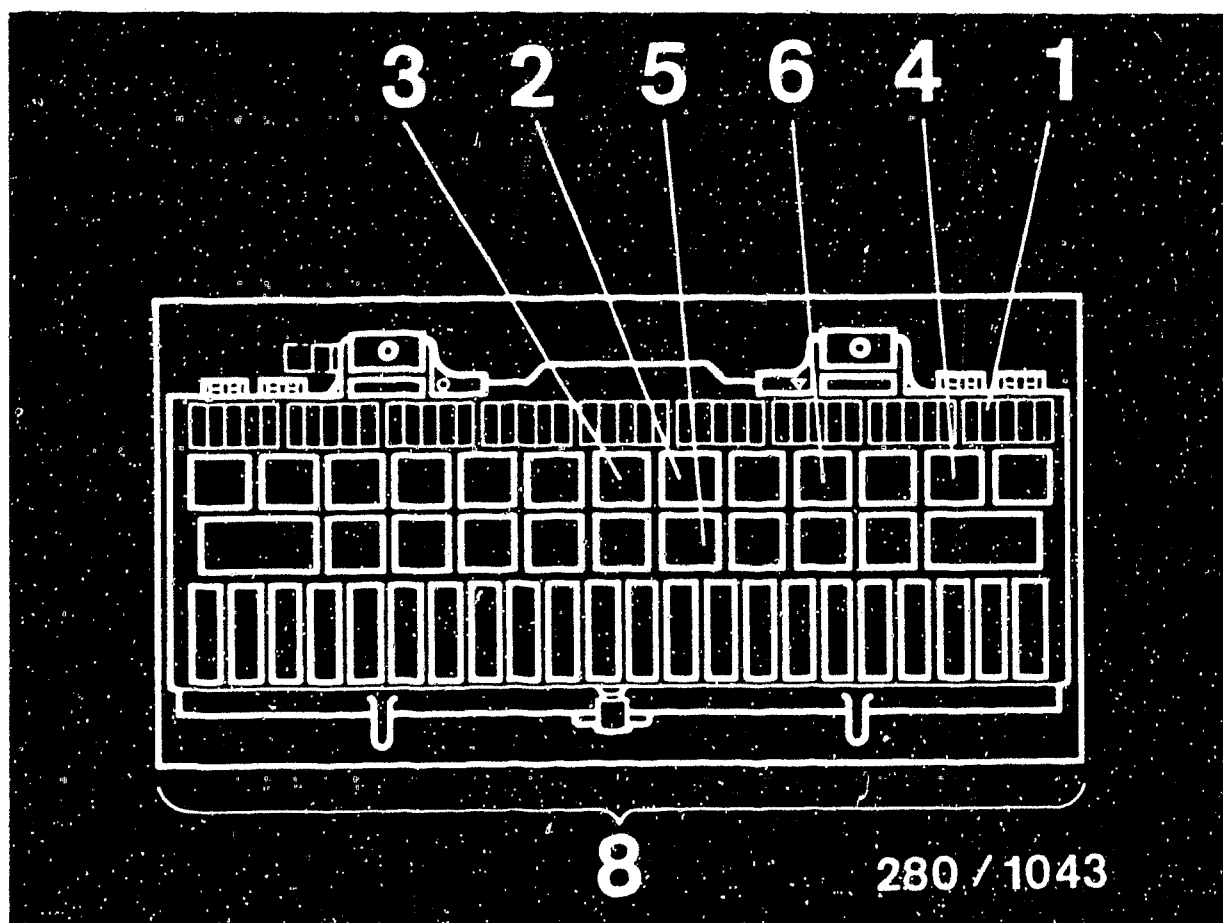


Top view of control-unit plug

Central-electrics box (up to 9.84)
 4 = Main relay
 6 = Pump relay
 8 = Central-electrics box plug



Trouble-shooting:
 For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.
 Check the following leads for continuity with ohmmeter
 (Set value: approx. 0 Ω):
 Up to 9.84:
 • From control-unit plug term. 9 to central-electrics box plug X term. no. 8.
 • From central-electrics box plug X term. no. 8 to main relay (4) term. 87.
 • From main relay term. 30 to pump relay (6) term. 30.
 • From pump relay (6) term. 30 to central-electrics box plug V term. no. 4.
 • From central-electrics box plug V term. no. 4 to positive battery terminal (disconnect battery).
 As of 10.84:
 • From control-unit plug term. 9 to central-electrics box plug W term. no. 23.
 • From central-electrics box plug W term. no. 23 to main relay (4) term. 87.
 • From main relay term. 30 to pump relay (6) term. 30.
 Continued on D 17



Central-electrics box (as of 10.84):

4 = Main relay

6 = Pump relay

8 = Central-electrics box plug

- From pump relay (6) term. 30 to central-electrics box plug U term. no. 12.
- From central-electrics box plug U term. no. 12 to positive battery terminal! (disconnect battery).

All vehicles:

If leads O.K., but test specification not obtained:

Replace main relay.

Connect battery after testing.

Eliminate contact resistances at the plug-in connections. Spring contacts must not allow themselves to be pushed back.

TEST STEP 11 Connect adapter lead to peripherals <u>only</u> .			
Operation		Reading	Testing of peripherals
Program switch "V" at position	7	Measuring equipment must indicate <div style="text-align: center;">8...15 V.</div>	Component: Power supply relay
Program switch "Ω" at position	21		
Measuring equipment: Motor-tester/multimeter			Operation: Power supply of control-unit plug term. 18
Measuring range: 15 V			
Connection: Red test socket/well = pos. Black test socket/well = ground		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Yes ↓ Continue testing with next test step. </div> <div style="text-align: center;"> No ↓ </div> </div>	Malfunction: No power supply
Operation in vehicle: Ignition "ON"			

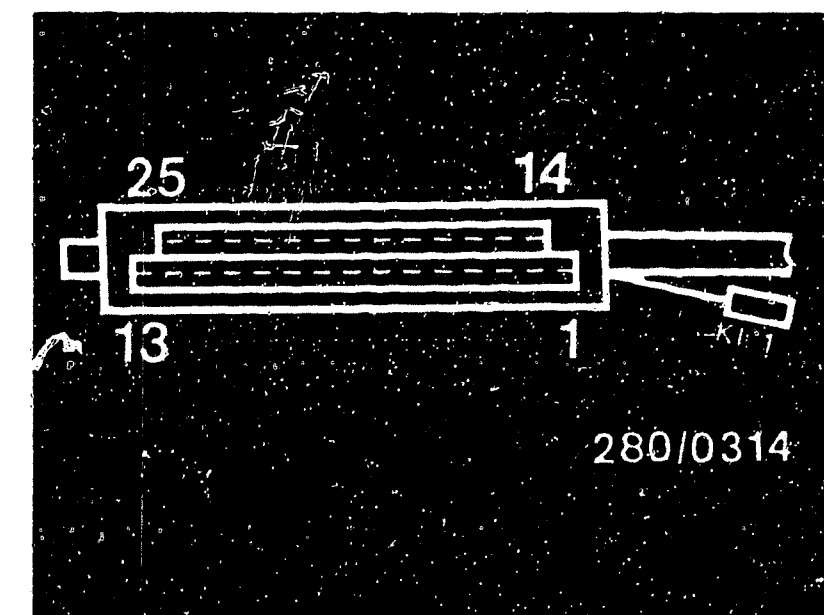
Trouble-shooting:
For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessar.

Check the following leads for continuity with ohmmeter
(Set value: approx. 0 Ω):

Up to 9.84:

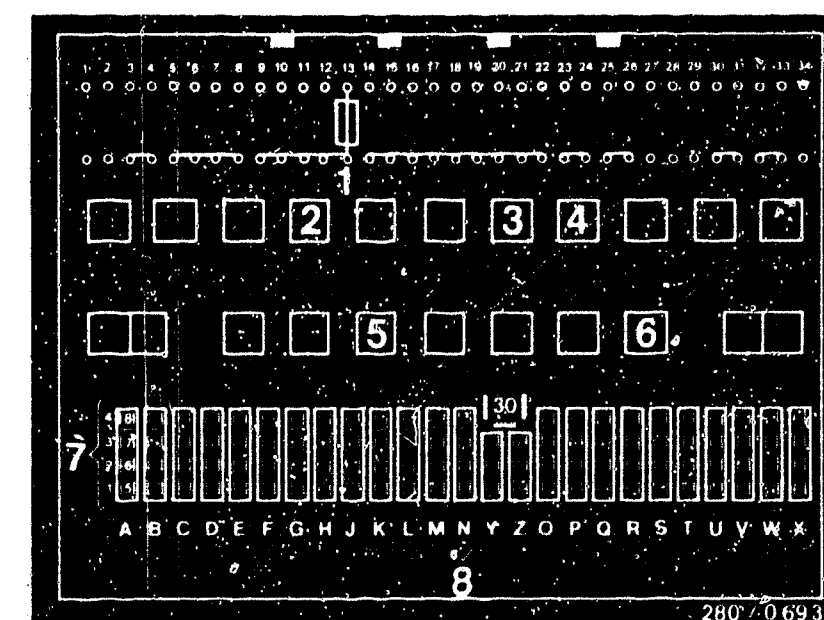
- From control-unit plug term. 18 to central-electrics box plug X term. no. 3.
- From central-electrics box plug X term. no. 3 to power supply relay (2) term. 87.
- From power supply relay (2) term. 30 to central-electrics box plug V term. no. 3.
- From central-electrics box plug V term. no. 3 to positive battery terminal (disconnect battery for measuring).

Continued on D 20



Top view of control-unit plug

Central-electrics box (up to 9.84)
2 = Power supply relay
8 = Central-electrics box plug



D 18

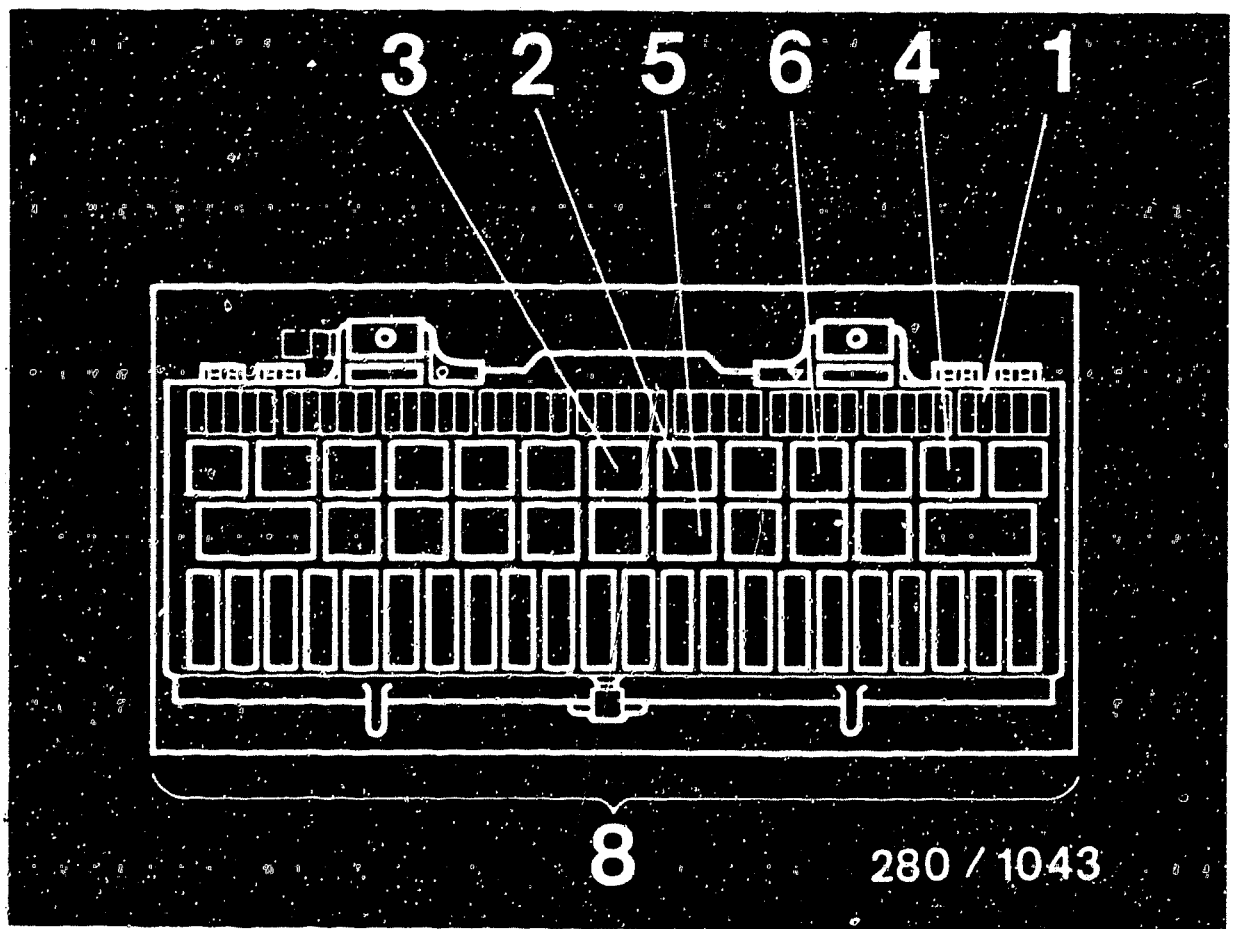
Test chart for universal test adapter
Porsche 928 S



D 19

Test chart for universal test adapter
Porsche 928 A





Central electrics box as of 10.84

2 = Power supply relay

8 = Central-electrics box plug

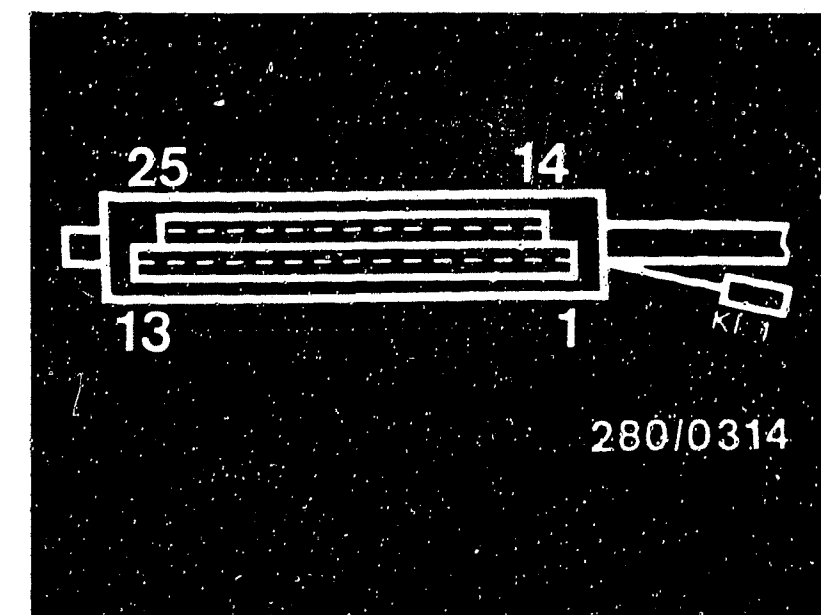
As of 10.84:

- From control-unit plug term. 18 to central-electrics box plug W term. no. 14.
- From central-electrics box plug W term. no. 14 to power supply relay (2) term. 87.
- From power supply relay (2) term. 30 to central-electrics box plug U term. no. 11.
- From central-electrics box plug U term. no. 11 to positive battery terminal. (Disconnect battery for measuring).

All vehicles:

Eliminate contact resistances at the plug-in connections. Spring contacts must not allow themselves to be pushed back. Reconnect battery after testing.

TEST STEP 12 Connect adapter lead to peripherals <u>only</u> .			
Operation		Reading	Testing of peripherals
Program switch "V" at position	8	Measuring equipment must indicate 8...15 V. I	Component: Main relay
Program switch "Ω" at position	21		
Measuring equipment: Motor-tester/multimeter			Operation: Main relay winding and ground connection term. 21
Connection: Red test socket/well = pos. Black test socket/well = ground		<div>Yes</div> <div>Continue test- ing with <u>next</u> test step.</div> <div>No</div>	Malfunction: No voltage reading
Operation in vehicle: Ignition "ON"			



Top view of control-unit plug

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter
(Set value approx. 0 Ω):

Up to 9.84:

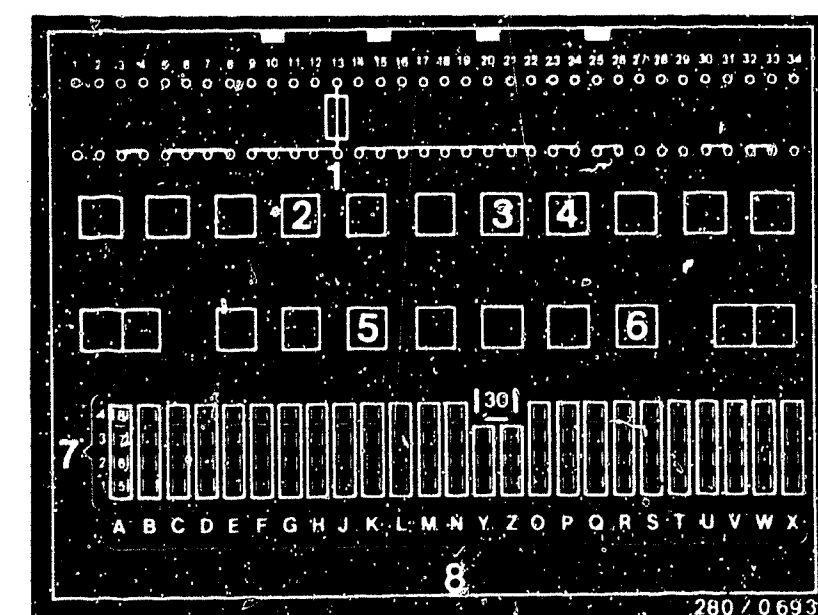
- From control-unit plug term. 21 to central-electrics box plug X term. no. 5.
- From central-electrics box plug X term. no. 5 to (LH-version) main relay (4) term. 85.
- From main relay (4) term. 86 to starting relay (3) term. 30.
- From starting relay (3) term. 30 to bar term. 30.

Central-electrics box (up to 9.84)

3 = Starting relay

4 = Main relay

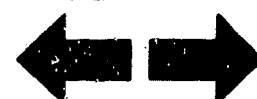
8 = Central-electrics box plug



Continued on D23

D21

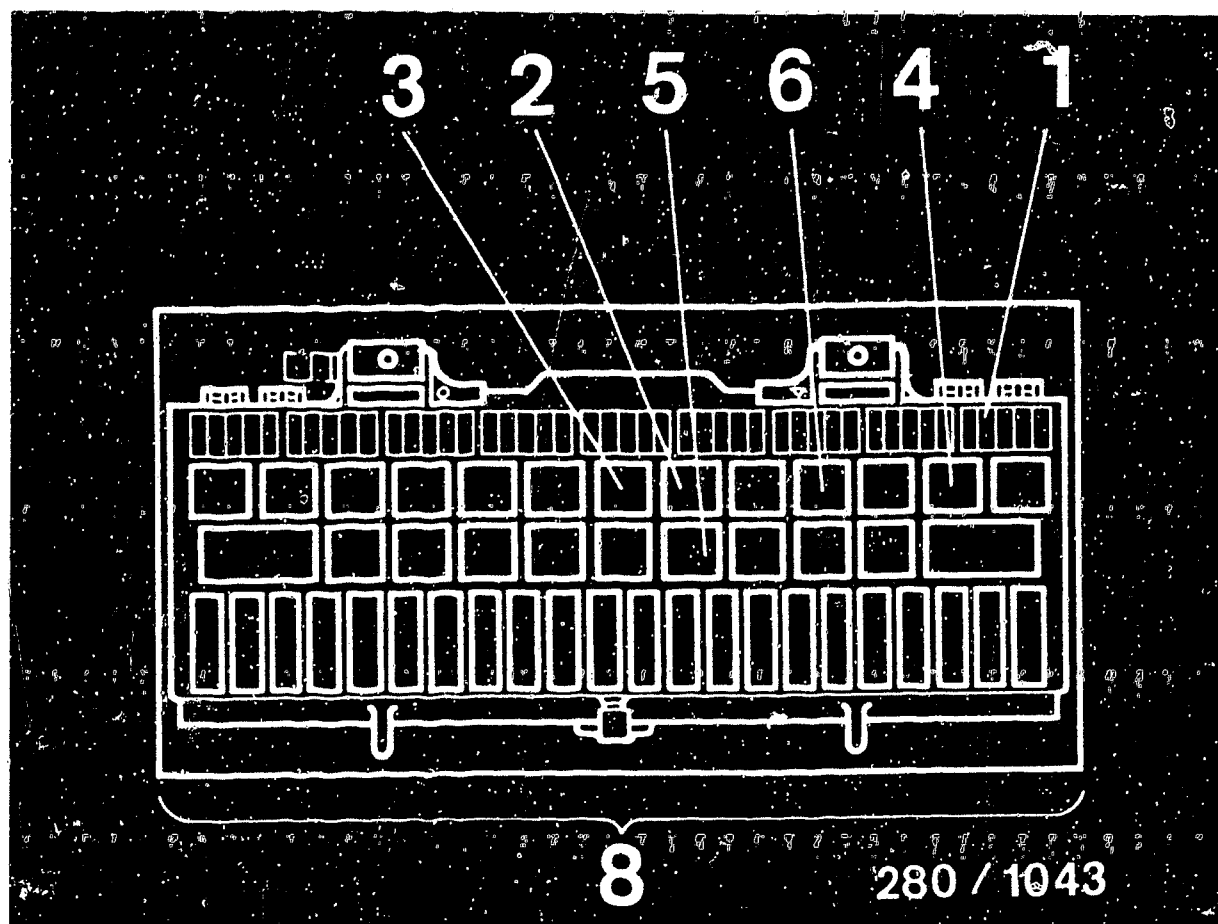
Test chart for universal test adapter
Porsche 928 S



D22

Test chart for universal test adapter
Porsche 928 S





Central-electrics box (as of 10.84):

3 = Starting relay

4 = Main relay

8 = Central-electrics box plug

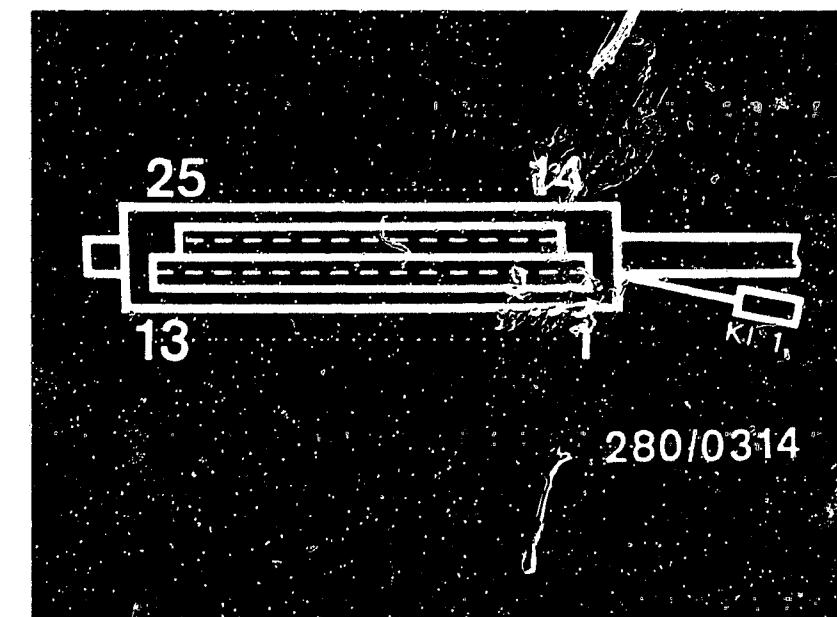
On vehicles as of 10.84:

- From control-unit plug term. 21 to central-electrics box plug W term. no. 21.
- From central-electrics box plug W term. no. 21 to main relay (4) term. 85.
- From main relay (4) term. 86 to starting relay (3) term. 30.
- From starting relay (3) term. 30 to bar term. 30.

All vehicles:

Eliminate contact resistances in the plug-in connections. Spring contacts must not allow themselves to be pushed back.

TEST STEP 13 Connect adapter lead to control unit and peripherals.			
Operation		Reading	Testing of peripherals
Program switch "V" at position	9	Measuring equipment must indicate 8...15 V.	Component: Pump relay
Program switch "2" at position	21		
Measuring equipment: Motor-tester/multimeter			Operation: Pump relay winding and ground connection term. 17
Measuring range: 15 V		<div> <div>Yes</div> <div>No</div> </div>	
Connection: Red test socket/well=pos. Black test socket/well=ground			Malfunction: No voltage reading
Operation in vehicle: Ignition "ON"			
		Continue test- ing with next test step.	



Top view of control-unit plug

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter
(Set value: approx. 0 Ω):

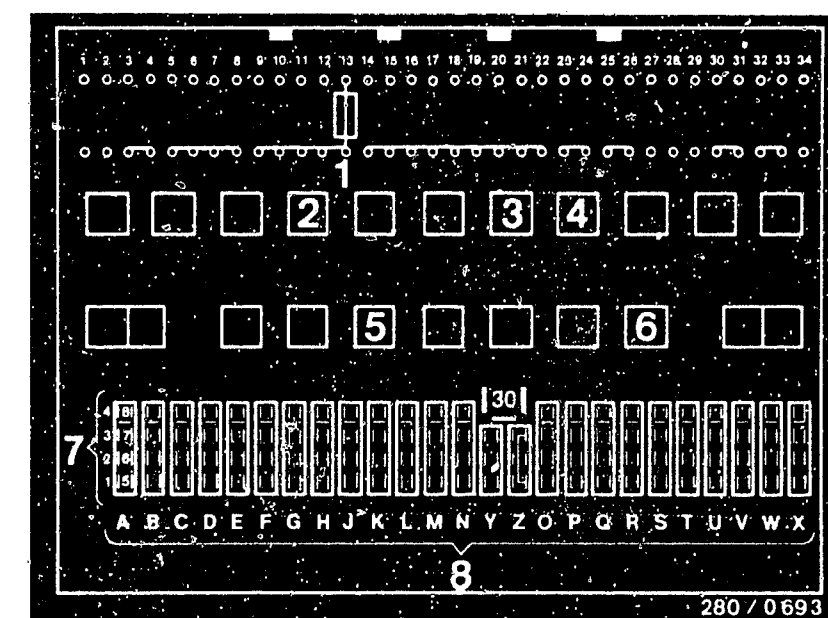
On vehicles up to 9.84:

- From control-unit plug term. 17 to central-electrics box plug X term. no. 4.
- From central-electrics box plug X term. no. 4 to pump relay (6) term. 85.
- From pump relay (6) term. 86 to central-electrics box plug 0 term. no. 6.
- From central-electrics box plug 0 term. no. 6 to both ignition coils term. 15.

Central-electrics box (up to 9.84)

6 = Pump relay

8 = Central-electrics box plug



Continued on E3

E1

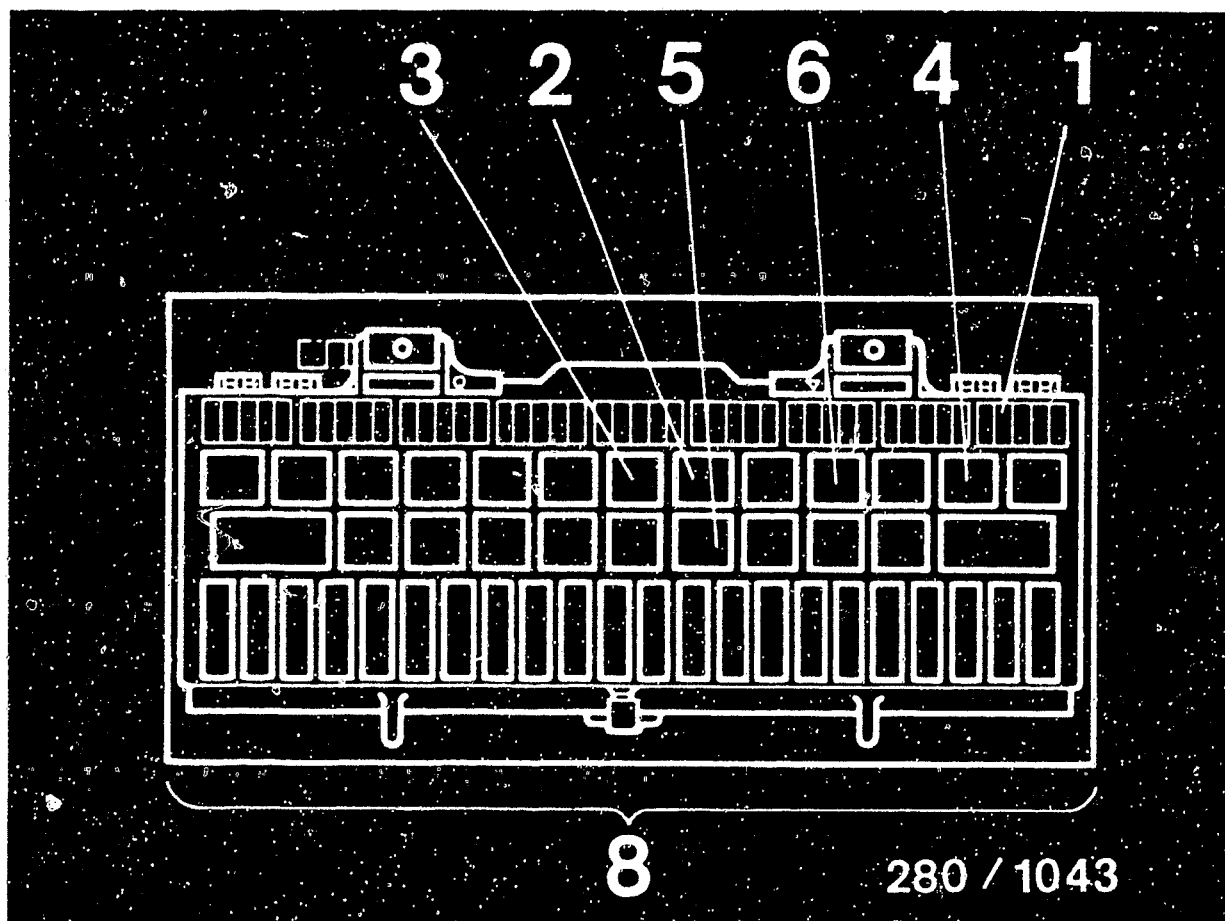
Test chart for universal test adapter
Porsche 928 S



E2

Test chart for universal test adapter
Porsche 928 S





Central-electrics box (as of 10.84):

6 = Pump relay

8 = Central-electrics box plug

On vehicles as of 10.84:

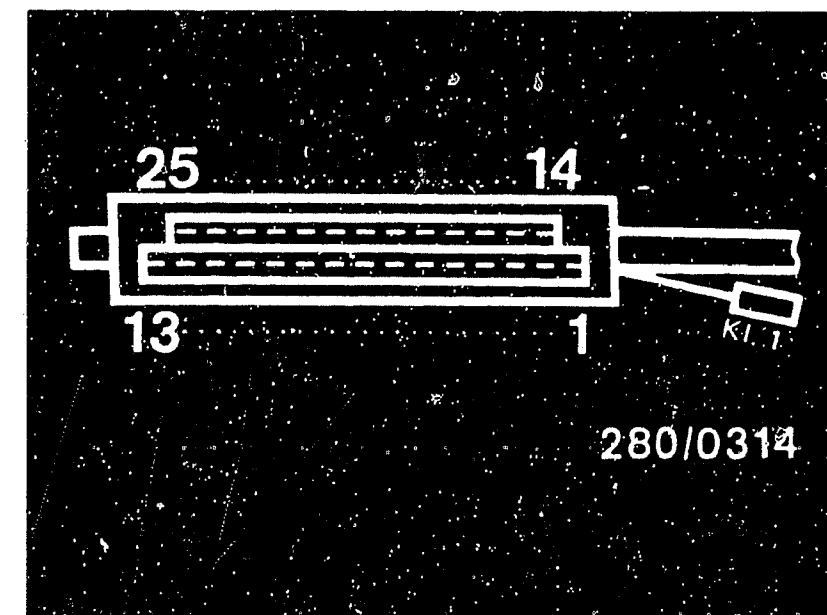
- From control-unit plug term. 17 to central-electrics box plug W term. no. 15.
- From central-electrics box plug W term. no. 15 to pump relay (6) term. 85.
- From pump relay (6) term. 86 through term. 15 to central-electrics box plug Q term. no. 11 and 12.
- From central-electrics box plug Q term. no. 11/12 to both ignition coils term. 15.

All vehicles:

- If leads O.K.: Replace pump relay. Eliminate contact resistances at the plug-in connections. Spring contacts must not allow themselves to be pushed back.
- Installation position of components: Ignition coils:
In engine compartment on left and right, near spring strut.

TEST STGE 14 Connect adapter lead to control unit and peripherals.

Operation		Reading	Testing of peripherals
Program switch "V" at position	3	Measuring equipment must indicate 2...5 V.	Component: Hot-wire air-mass sensor
Program switch "Q" at position	21		
Measuring equipment: Motor-tester/multimeter			
Measuring range: 10 V			Operation: Output voltage between term. 7 and term. 6
Connection: Red test socket/well = pos. Black test socket/well = ground		Yes ↓	Malfunction: No voltage reading No voltage change
Operation in vehicle: Let engine run. If engine speed changes, output voltage must also change.		No ↓	
		Continue testing with next test step.	



Top view of control-unit plug

1 = Hot-wire air-mass sensor
3 = Plug

Trouble-shooting:

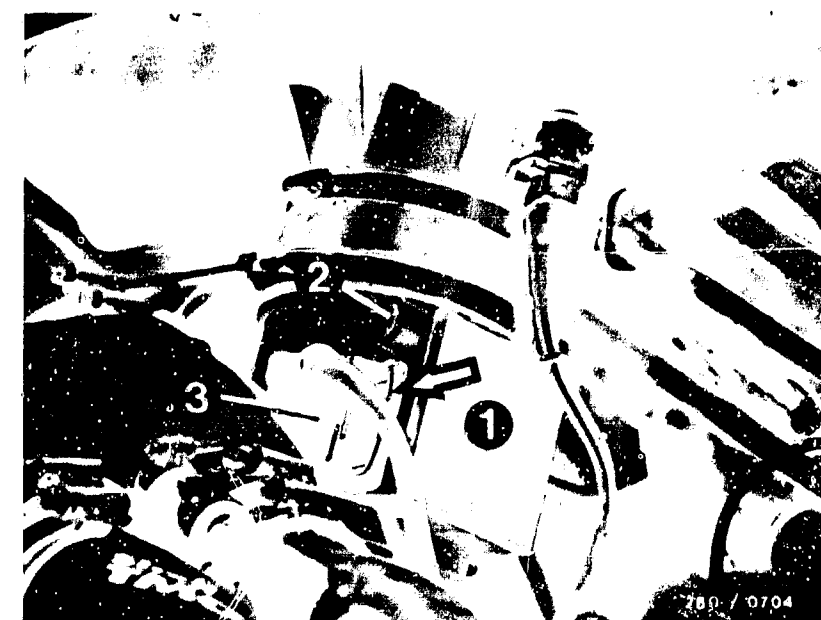
For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter

(Set value: approx. 0 Ω):

- From control-unit plug term. 7 to hot-wire air-mass sensor term. 5.
- From hot-wire air-mass sensor term. 3 to control-unit plug term. 6.
- From hot-wire air-mass sensor term. 4 to electronics ground terminal.

Continued on E6/E7



E4

Test chart for universal test adapter
Porsche 928 S



E5

Test chart for universal test adapter
Porsche 928 S



Trouble-shooting - test step 14 (continued)

On vehicles up to 9.84:

- From hot-wire air-mass sensor term. 2 to central-electrics box plug X term. no. 8.
- From central-electrics box plug X term. no. 8 to main relay (4) term. 87.

On vehicles as of 10.84:

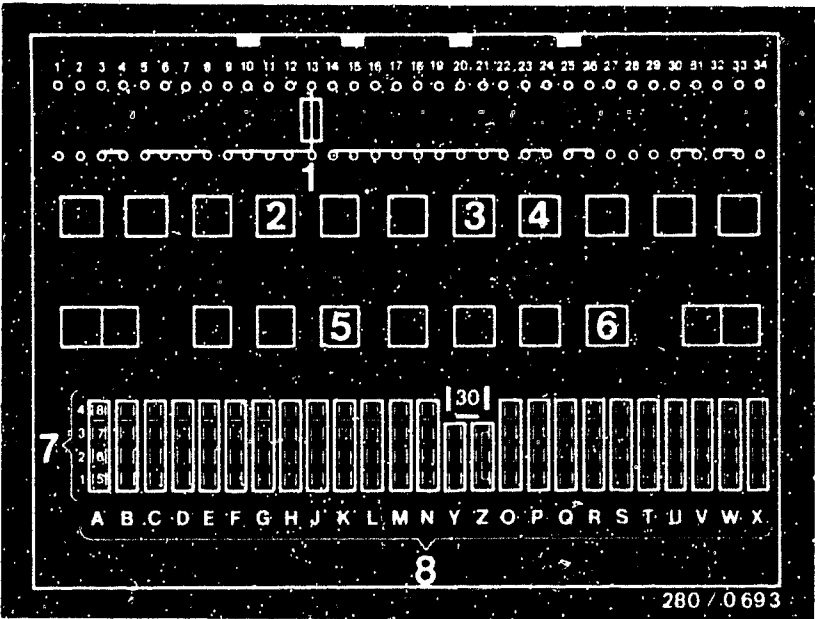
- From hot-wire air-mass sensor term. 2 to central-electrics box plug W term. no: 23.
- From central-electrics box plug W term. no. 23 to main relay term. 87.

All vehicles:

Note: When engine speed changes, there must also be a change in the output voltage.
Eliminate contact resistances at the plug-in connections.
Spring contacts must not allow themselves to be pushed back.

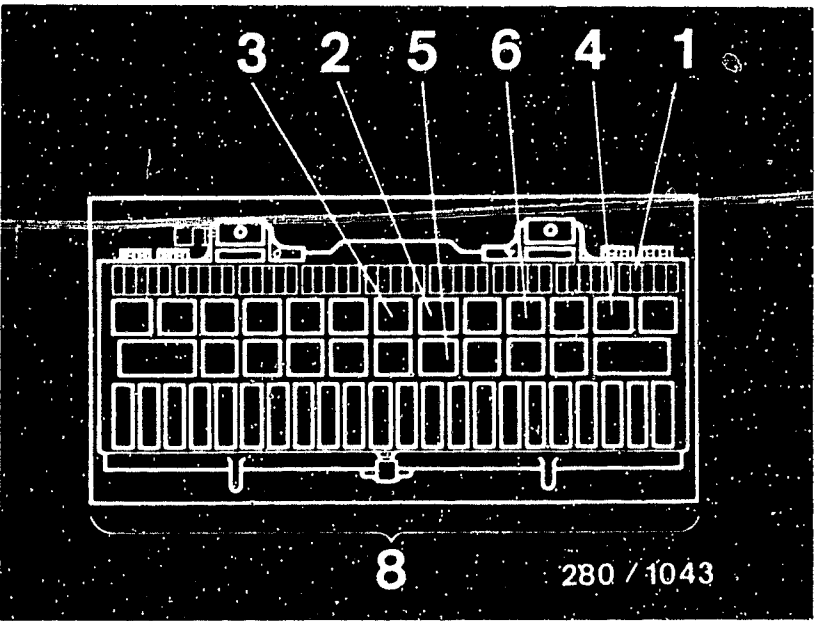
Installation position of components

Electronics ground terminal: On the right-hand valve cover under the blow-off change-over valve.



Central-electrics box up to (9.84)
4 = Main relay

Central-electrics box (as of 10.84)
4 = Main relay



E6

Test chart for universal test adapter
Porsche 928 S

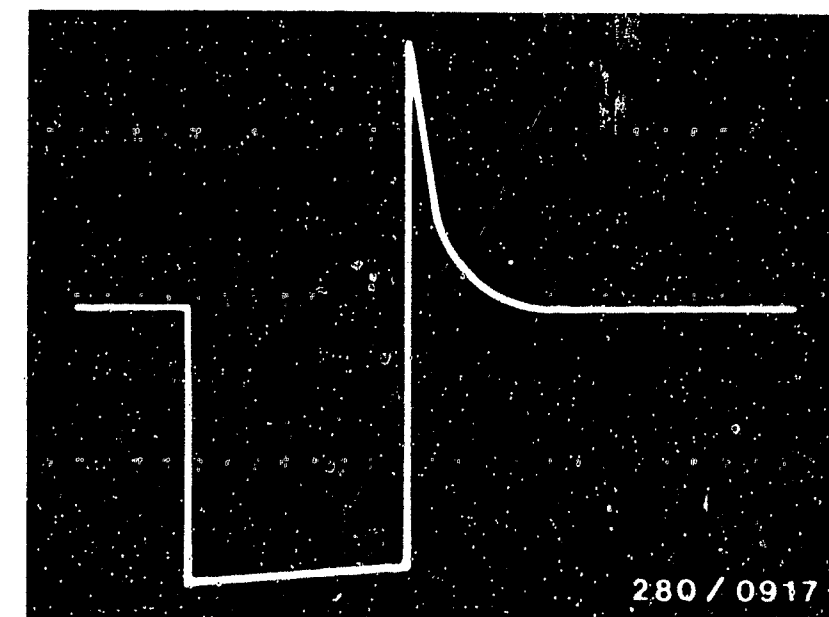


E7

Test chart for universal test adapter
Porsche 928 S



TEST STEP 15 Connect adapter lead to control unit and peripherals.			
Operation		Reading	Testing of control unit
Program switch "V" at position	12	Measuring equipment must indicate injection signal. (See diagram at top right).	Component: Control unit
Program switch "Q" at position	21		
Measuring equipment: Ignition oscilloscope			Operation: Output stage
Measuring range: ms/20 V special input			
Connection: Red test socket/well = pos. Black test socket/well = ground		<div> <div>Yes</div> <div>No</div> </div>	Malfunction: No injection signal or incorrect injection signal
Operation in vehicle: Warm up engine and run			
		Continue testing with next test step.	



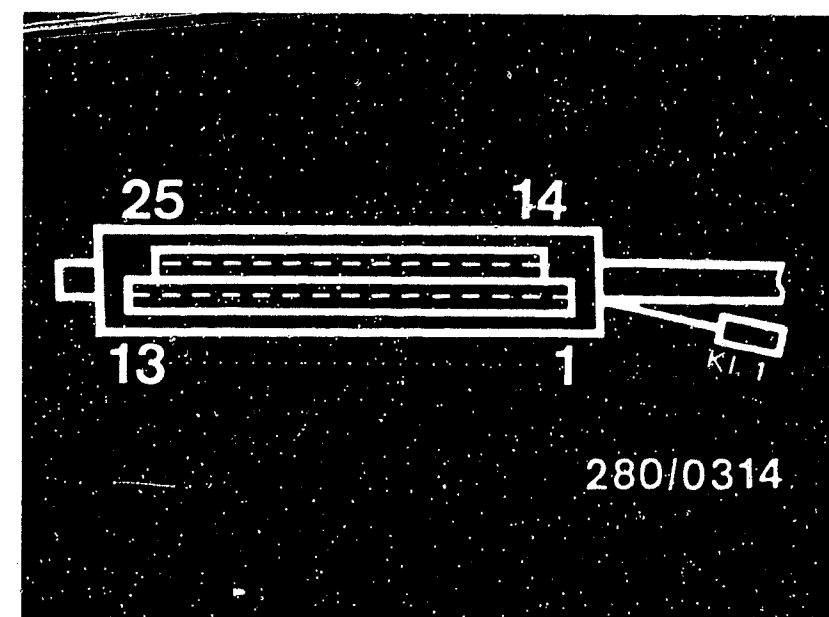
Injection signal

Trouble-shooting:
For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

If no injection signal visible on oscilloscope, change triggering. (Move clamp-on pickup to a different cylinder).

No injection signal or incorrect injection signal: Replace control unit.

Top view of control-unit plug



E8

Test chart for universal test adapter
Porsche 928 S

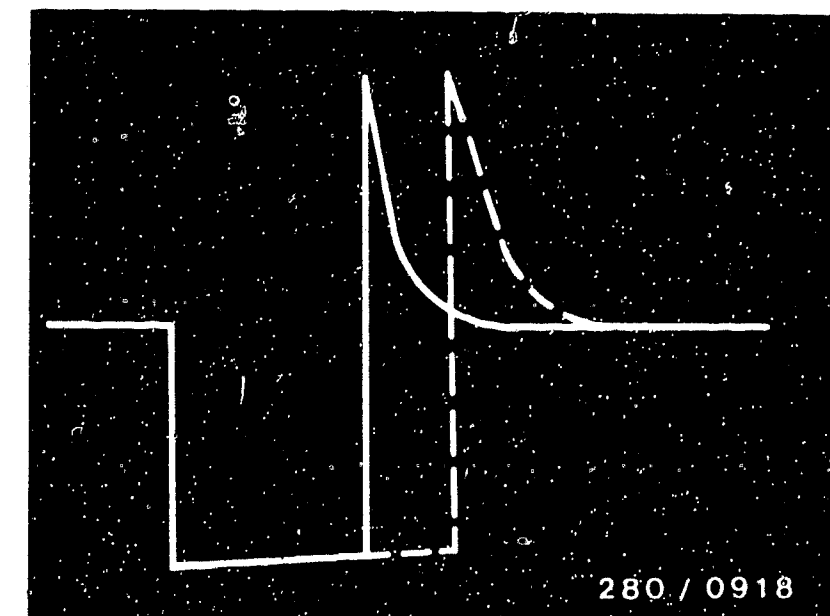


E9

Test chart for universal test adapter
Porsche 928 S

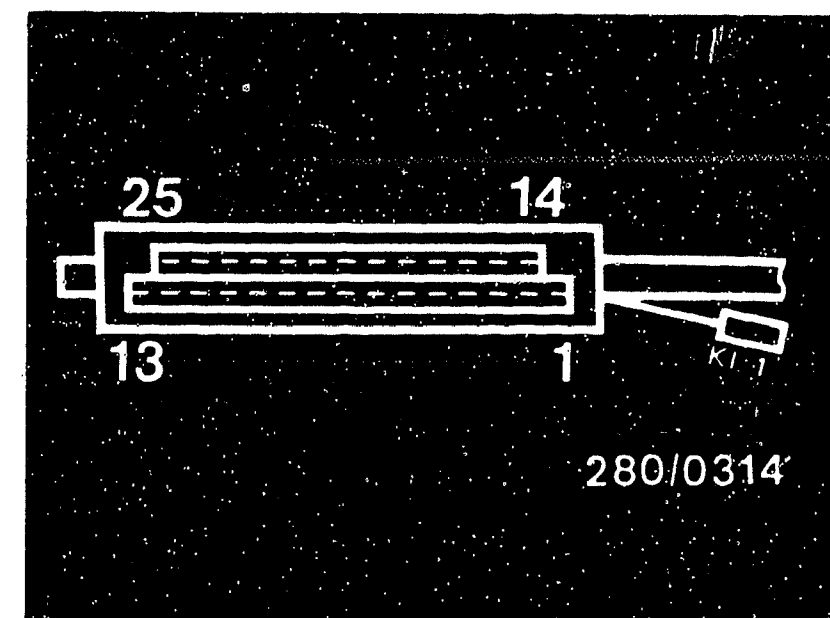


TEST STEP 16 Connect adapter lead to <u>control unit and peripherals.</u>			
<u>Operation:</u>		<u>Reading:</u>	<u>Testing of control unit:</u>
<u>Program switch "V"</u> <u>at position</u>	12	Measuring equipment must indicate injection signal. After pressing button T1 (NTC II - cold) injec- tion signal <u>must become</u> <u>wider</u> (see top diagram).	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> <u>at position</u>	21		
<u>Measuring equipment:</u> Ignition oscilloscope		<u>Press button only</u> <u>briefly.</u> (Heavy enrich- ment).	<u>Operation:</u> Influence of cold tempera- ture (engine)
<u>Measuring range:</u> ms/20 V special input			
<u>Connection:</u> Red test socket/well = pos. Black test socket/well = ground		<div><div>Yes</div><div>Continue test- ing with <u>next</u> <u>test step.</u></div></div> <div><div>No</div><div></div></div>	<u>Malfunction:</u> After pressing button T1 injection signal does not become wider.
<u>Operation in vehicle:</u> Warm up engine and run			
Press button 1			



Widened injection signal after pressing button T1

Top view of control-unit plug



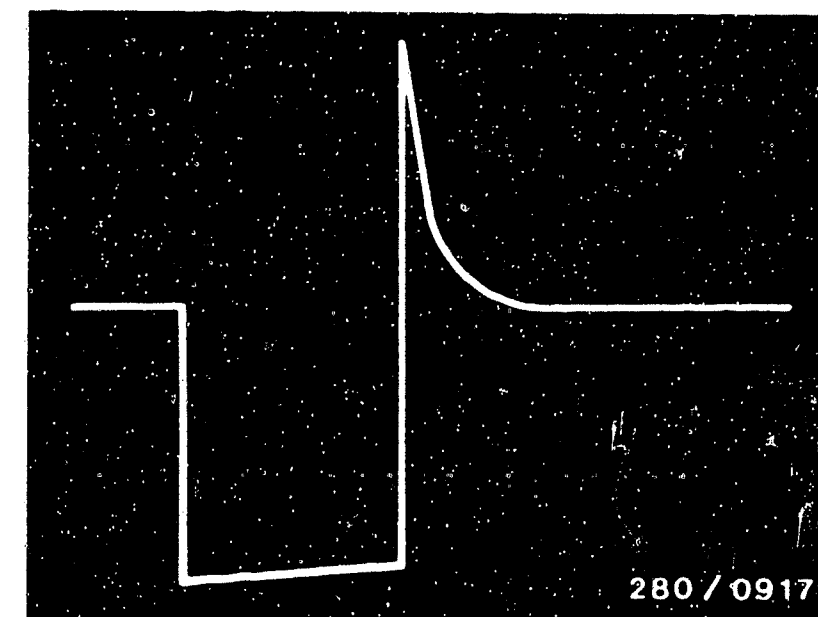
TEST STEP 17 Connect adapter lead to control unit and peripherals.			
Operation:		Reading:	Testing of control unit:
Program switch "V" at position	12	Measuring equipment must indicate injection signal. After pressing T2 injection signal must not become wider. (See top diagram).	Component: Control unit
Program switch "Ω" at position	21		
Measuring equipment: Ignition oscilloscope			
Measuring range: ms/20 V special input			
Connection: Red test socket/well = pos. Black test socket/well = ground			
Operation in vehicle: Warm up engine and run		Yes ↓ Continue testing with next test step.	Operation: Influence of warm temperature (engine)
Press button 2			
		No ↓	Malfunction: After pressing button T2 injection signal becomes wider.

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

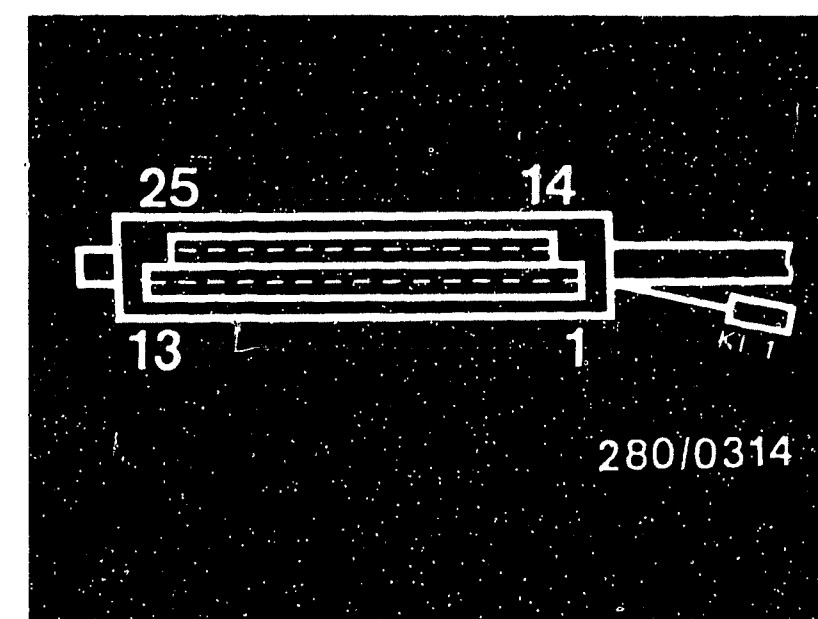
If injection signal becomes wider, engine is not at normal operating temperature. Let engine run at 3000 min⁻¹ for approx. 5 minutes. Repeat test.

If fault not remedied, replace control unit.



Injection signal

Top view of control-unit plug



E12

Test chart for universal test adapter
Porsche 928 S

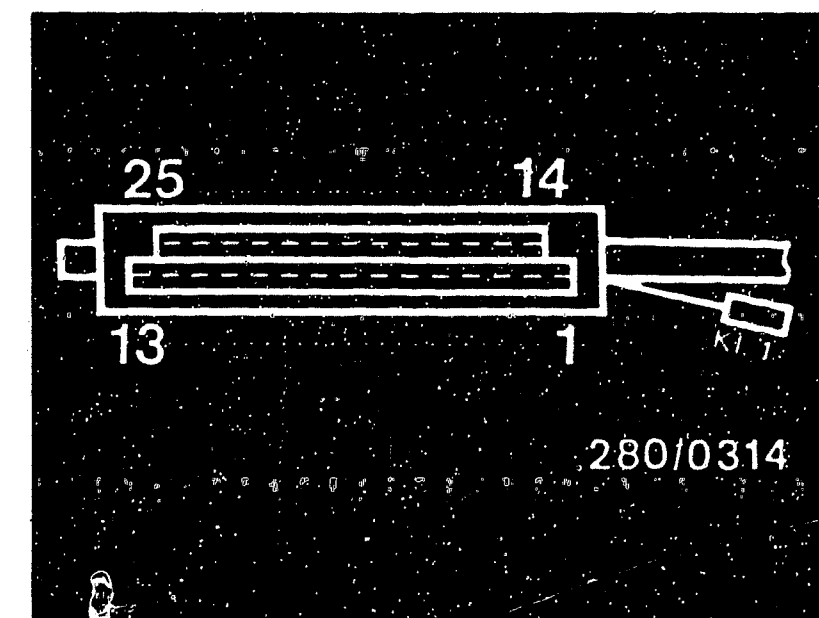


E13

Test chart for universal test adapter
Porsche 928 S



TEST STEP 18 Connect adapter lead to control unit and peripherals.			
Operation:		Reading:	Testing of control unit:
Program switch "V" at position	12	Measuring equipment must briefly indicate no injection pulses*.	Component: Control unit
Program switch "Q" at position	21		
Measuring equipment: Ignition oscilloscope			
Measuring range: ms/20 V special input			Operation: Overrun cutoff
Connection: Red test socket/well = pos. Black test socket/well = ground		<div>Yes</div> <div>No</div>	Malfunction: Injection signals
Operation in vehicle: Warm up engine and run			
Press button 5		Continue test- ing with next test step.	



Top view of control-unit plug

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

- * Hold engine speed constant at 2000 min^{-1} .
Press button 5.
Injection signals stop and start again at approx. 1300 min^{-1} .
Release button 5 and press again (hold engine speed constant).
The same must happen again.

If incorrect, replace control unit.

E14

Test chart for universal test adapter
Porsche 928 S

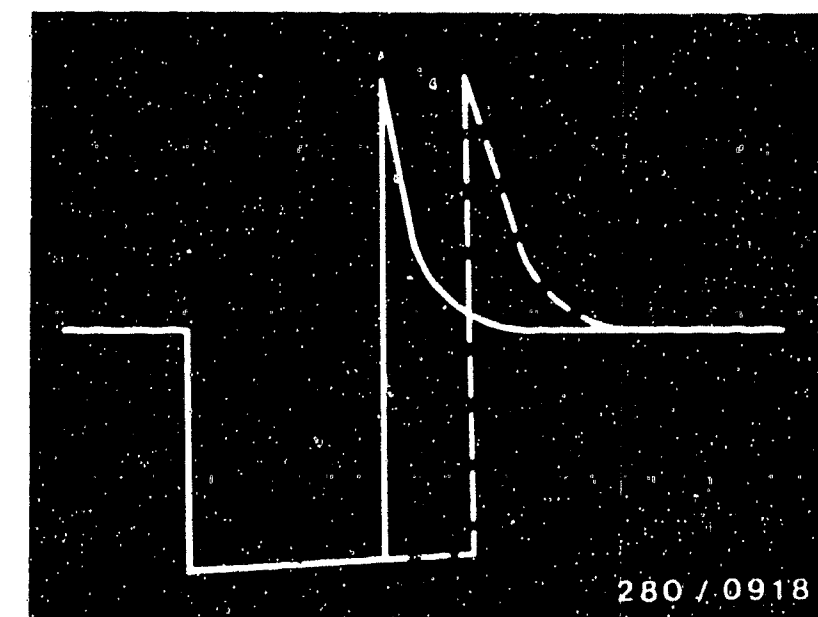


E15

Test chart for universal test adapter
Porsche 928 S

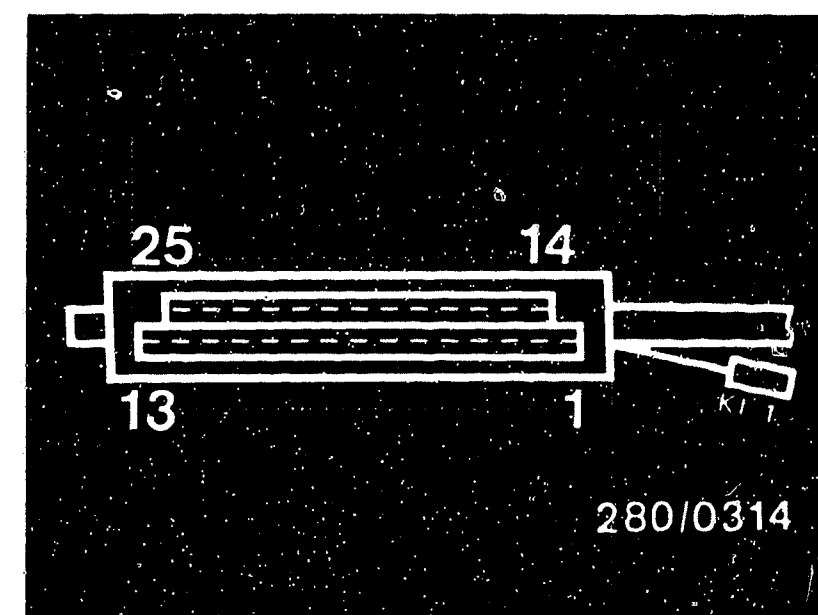


TEST STEP 19 Connect adapter lead to <u>control unit and peripherals.</u>			
<u>Operation:</u>		<u>Reading:</u>	<u>Testing of control unit:</u>
<u>Program switch "V"</u> <u>at position</u>	12	Measuring equipment must indicate <u>injection pulse.</u> After pressing button T6 (full-load enrich- ment) injection signal must become slightly <u>wider</u> (see top diagram).	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> <u>at position</u>	21		<u>Operation:</u> Full-load enrichment
<u>Measuring equipment:</u> Ignition oscilloscope			
<u>Measuring range:</u> ms/20 V special input			
<u>Connection:</u> Rest test socket/well = pos. Black test socket/well = ground			
<u>Operation in vehicle:</u> Warm up engine and run		<div><div>Yes</div><div>Continue test- ing with <u>next</u> <u>test step.</u></div></div> <div><div>No</div><div></div></div>	<u>Malfunction:</u> Injection signal does not become wider
Press button 6			



Widened injection signal after pressing button T6

Top view of control-unit plug



Trouble-shooting:

For testing, disconnect control-unit plug from test adapter and use circuit diagram if necessary.

If the injection pulse does not become wider, the engine speed must become higher. If the injection signal does not become wider or the engine speed does not become higher and the driver complains about "maximum engine power not reached" - replace control unit.

E16

Test chart for universal test adapter
Porsche 928 S

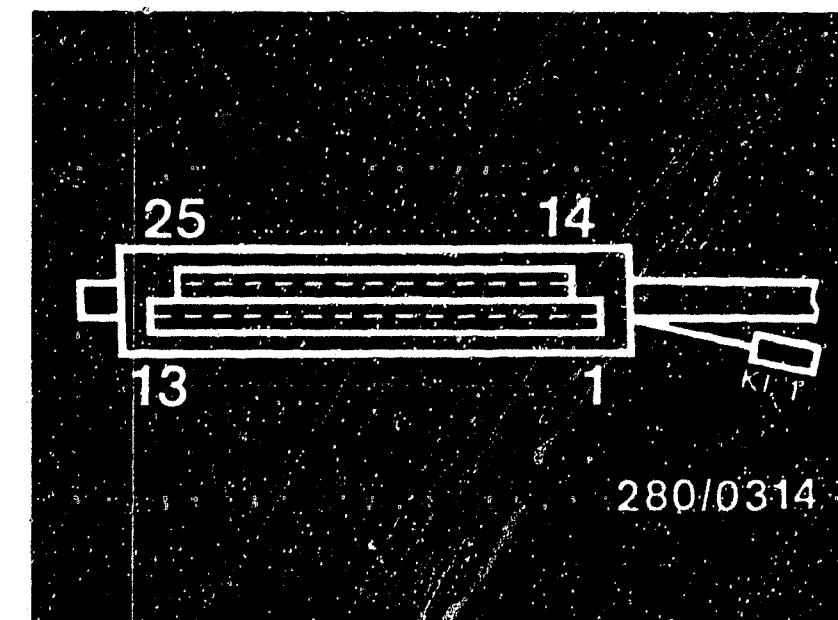


E17

Test chart for universal test adapter
Porsche 928 S

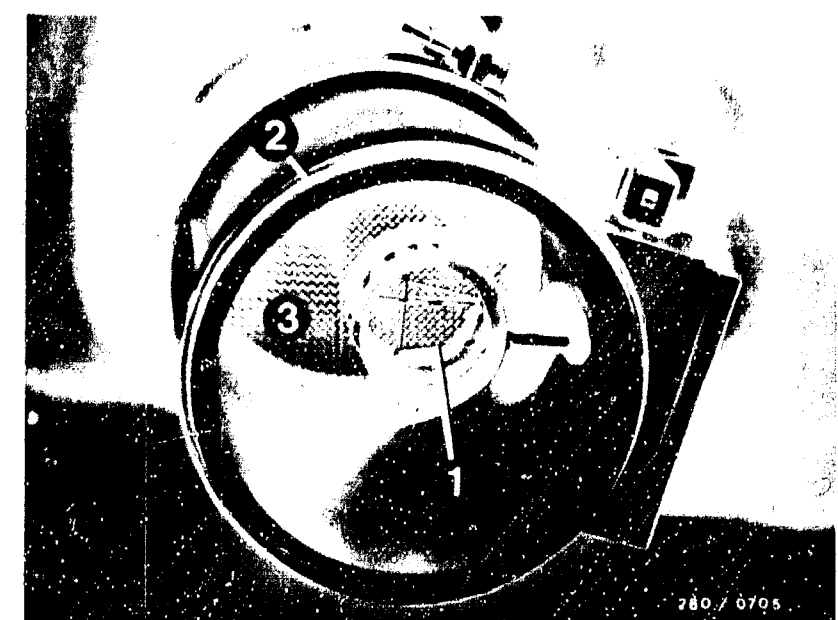


TEST STEP 20 Connect adapter lead to <u>control unit and peripherals.</u>			
Operation:		Reading:	Testing of control unit:
Program switch "V" at position	13	After approx. 4 sec. measuring equipment must indicate a voltage of 2...5 V (reading lasts approx. 1 sec.).	Component: Control unit
Program switch "Ω" at position	21		
Measuring equipment: Motor-tester/multimeter			
Measuring range: 10 V		<div> <div>Yes</div> <div>No</div> </div>	Operation: Self-cleaning (term. 8 to term. 11)
Connection: Red test socket/well = pos. Black test socket/well = ground			
Operation in vehicle: Warm up engine and bring to min. 2000 min ⁻¹ . (Briefly). Then ignition "OFF"			
		Continue testing with <u>fuel pressure test.</u>	Malfunction: Continuous pulse or no pulse



Top view of control-unit plug

1 = Hot wire



E18

Test chart for universal test adapter
Porsche 928 S



E19

Test chart for universal test adapter
Porsche 928 S



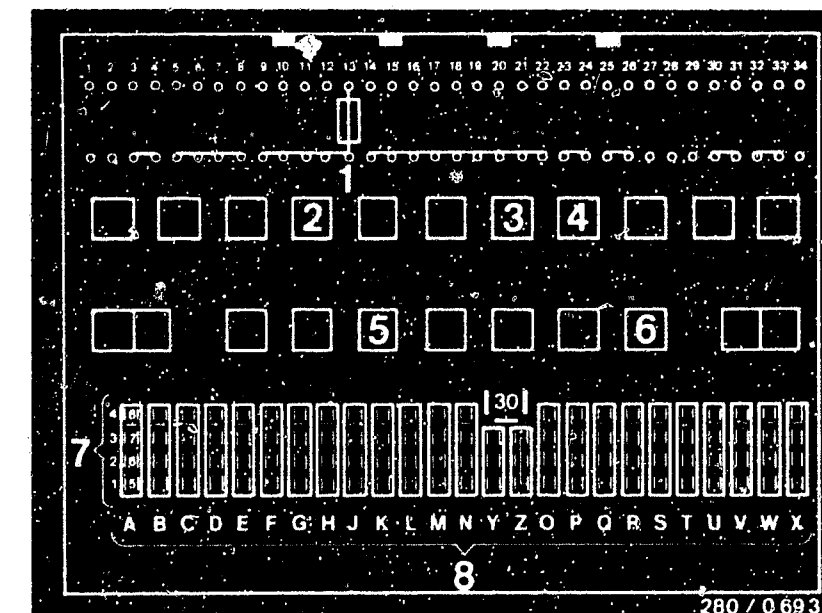
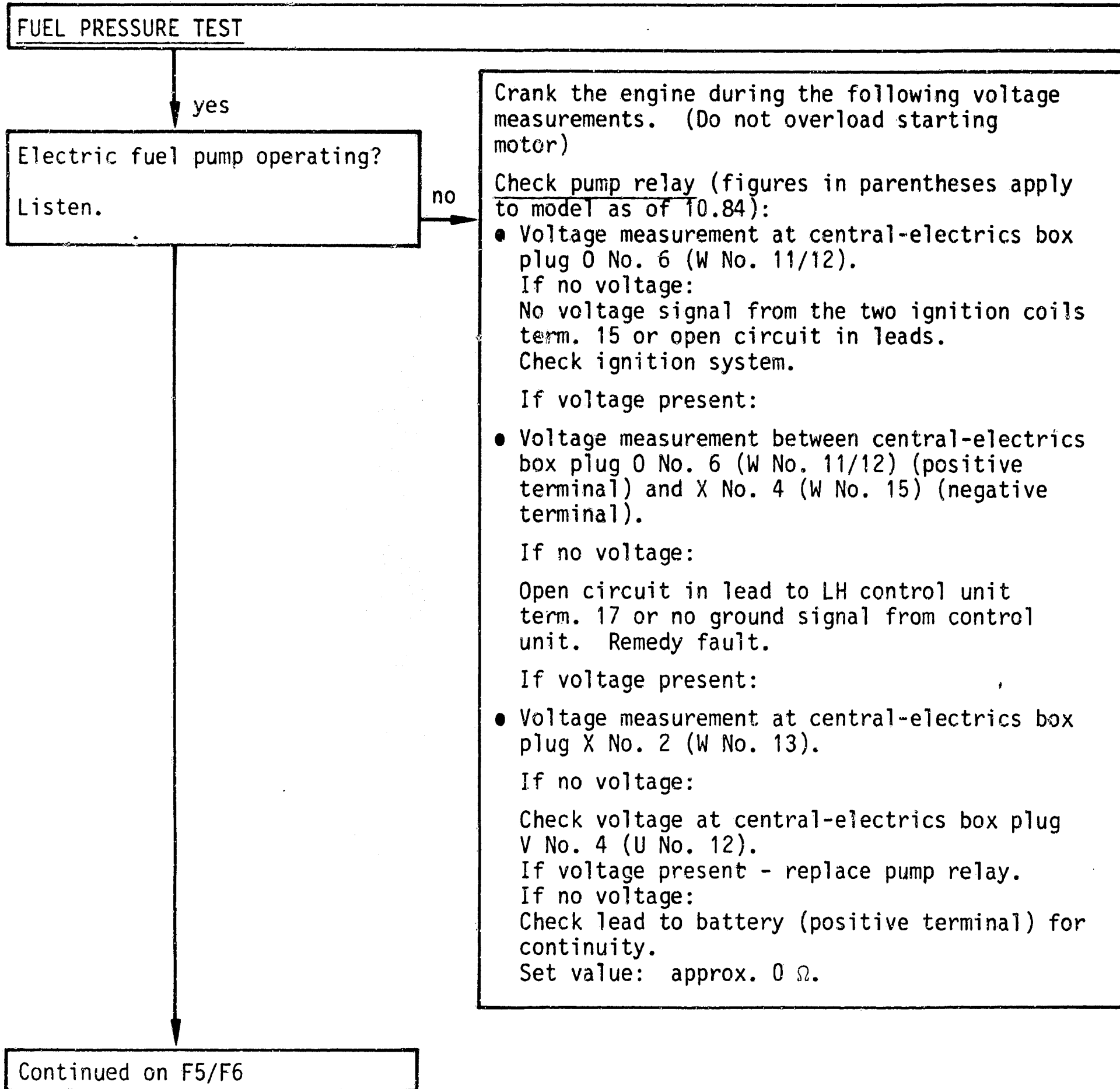
Testing with the universal test adapter is now completed.

The fuel pressure test must now be performed.

If a fault is found during a test, the test must be repeated after the fault has been eliminated.

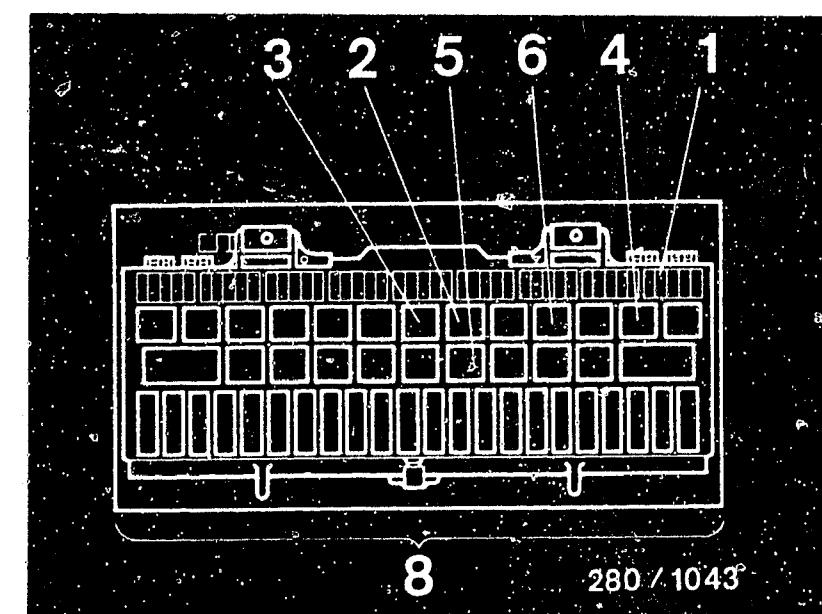
The fuel pressure test is on Coordinates F1...F14.





Central-electrics box (up to 9.84):
6 = Pump relay
8 = Central-electrics box plug

Central-electrics box (as of 10.84):
6 = Pump relay
8 = Central-electrics box plug



Fuel pressure test (continued)

yes

If voltage present:

Check pump fuse No. 13 (No. 42)

- Measure voltage at central plug T No. 5 (U No. 15).

If no voltage:

Replace pump fuse.

If voltage present:

- Measure voltage directly at electric fuel pump.

If no voltage (set value min. 12 V):

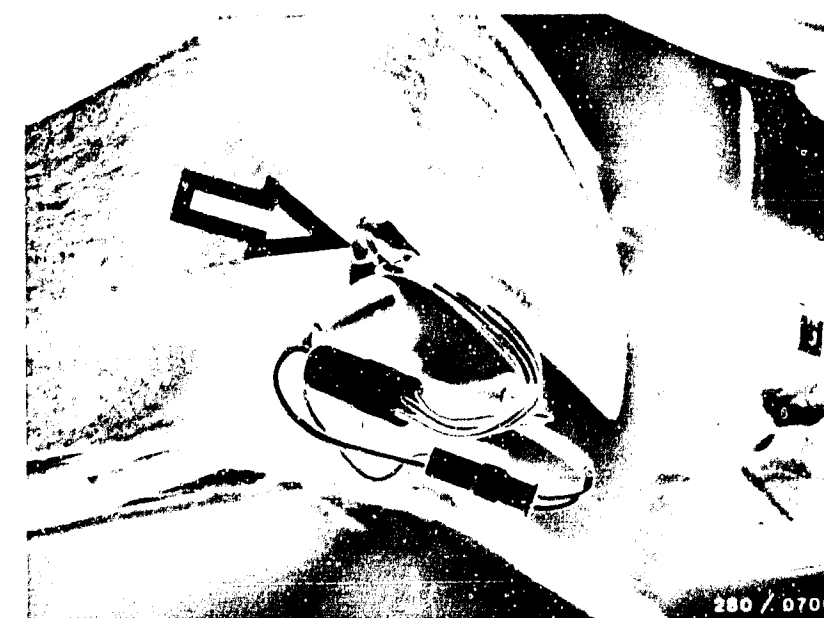
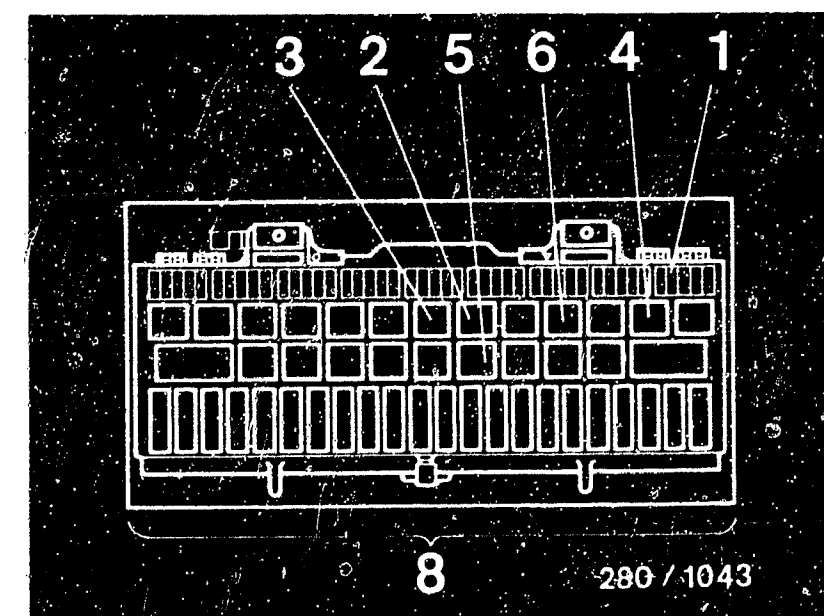
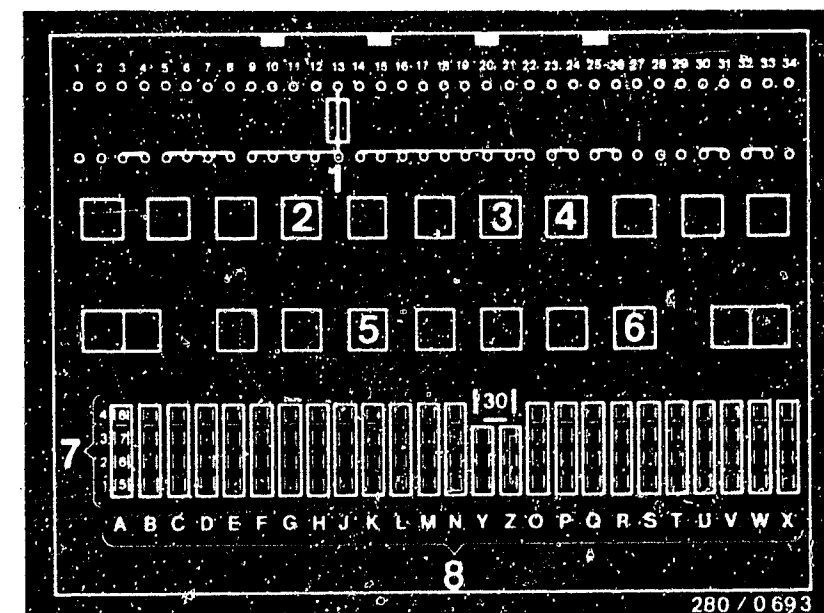
Check lead between central plug T No. 5 (U No. 5) and electric fuel pump for continuity and good electrical contact .

- Ground connection of electric fuel pump O.K.? (Bottom picture, arrow). (Behind rear side panelling on right).
Check ground contact.
Establish good ground connection.

- Despite voltage present, electric fuel pump not operating:
Replace electric fuel pump.

Continued on F5/F6

Continued on F5/F6



F3

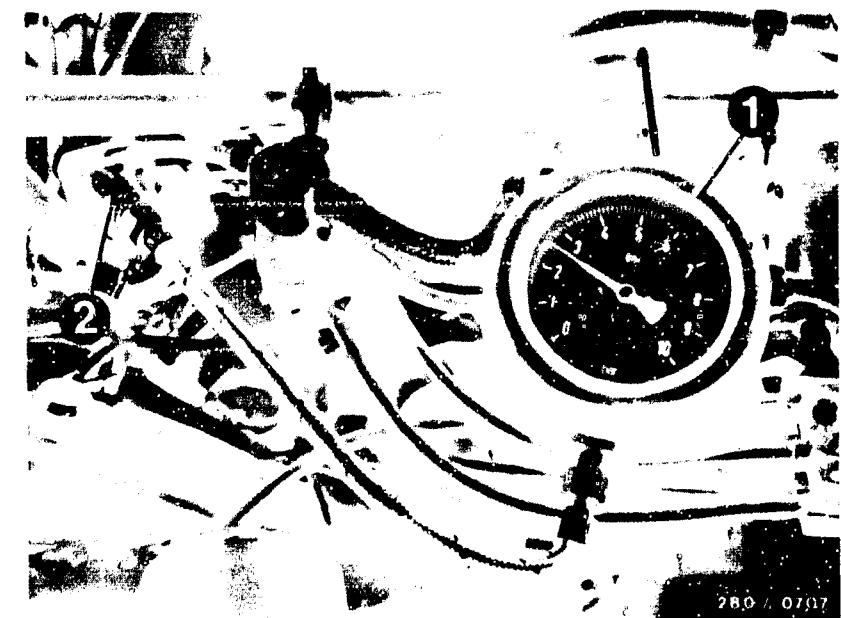
Fuel pressure test
Porsche 928 S



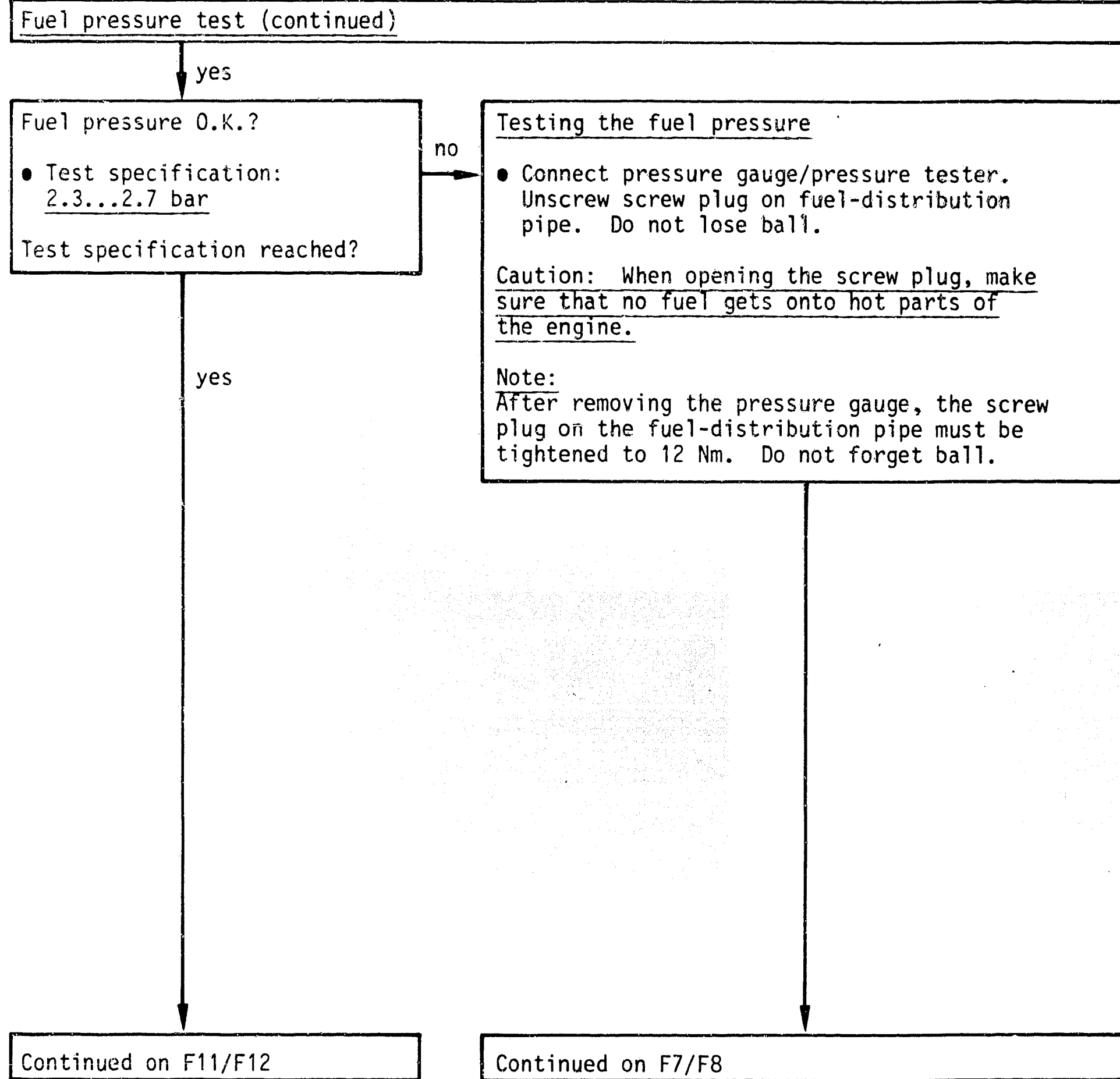
F4

Fuel pressure test
Porsche 928 S





1 = Pressure gauge
2 = Connection point
(right-hand fuel-distribution
pipe at front)



F5

Fuel pressure test
Porsche 928 S



F6

Fuel pressure test
Porsche 928 S



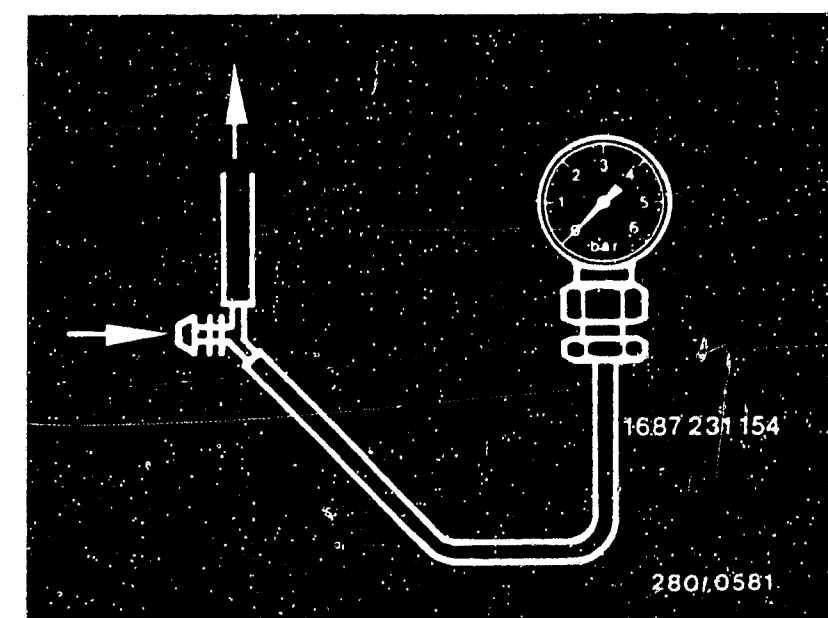
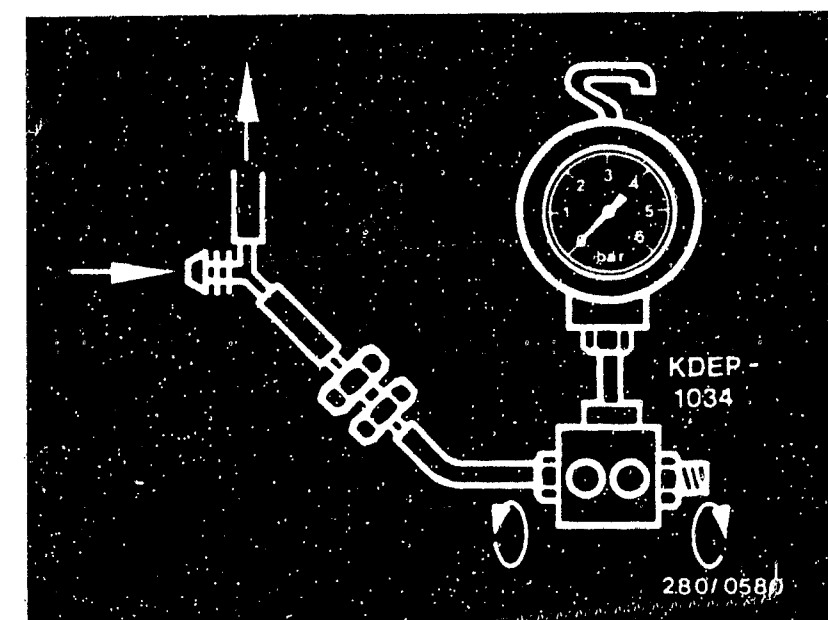
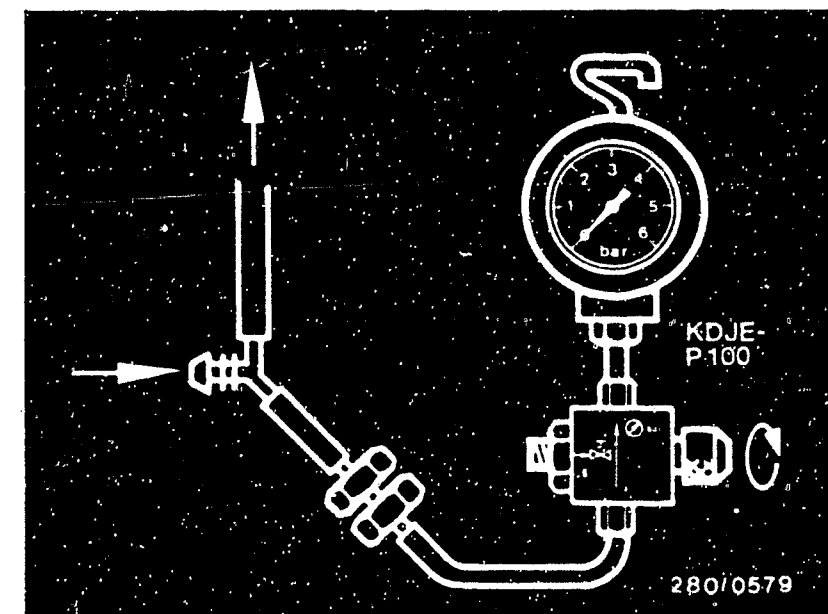
Fuel pressure test (continued)

Testing the fuel pressure

Connect connections of pressure tester into the fuel delivery line. If using pressure tester KDJE-P 100, close the valve screw. If using KDEP 1034, close only the right-hand one. The end of the hose is plugged onto the fuel-distribution pipe; the free Y-piece connection is plugged onto the fuel delivery hose.

Make sure there are no leaks.

yes



Continued on F11/F12

Continued on F9/F10

F7

Fuel pressure test
Porsche 928 S



F8

Fuel pressure test
Porsche 928 S



Fuel pressure test (continued)

● Jumping the safety circuit

Central-electrics box behind cover plate in front passenger footwell. Take away floor mat and hinge up running plate. Disconnect pump relay (6) and insert jumper between term. 30 and term. 87.

Bottom picture

1 = Jumper with fuse holder and 10 A fuse (user-fabricated)

2 = Top view of connection base

Switch on ignition. Read off fuel pressure on pressure gauge.

Fuel pressure:

Test specification: 2.3 ... 2.7 bar

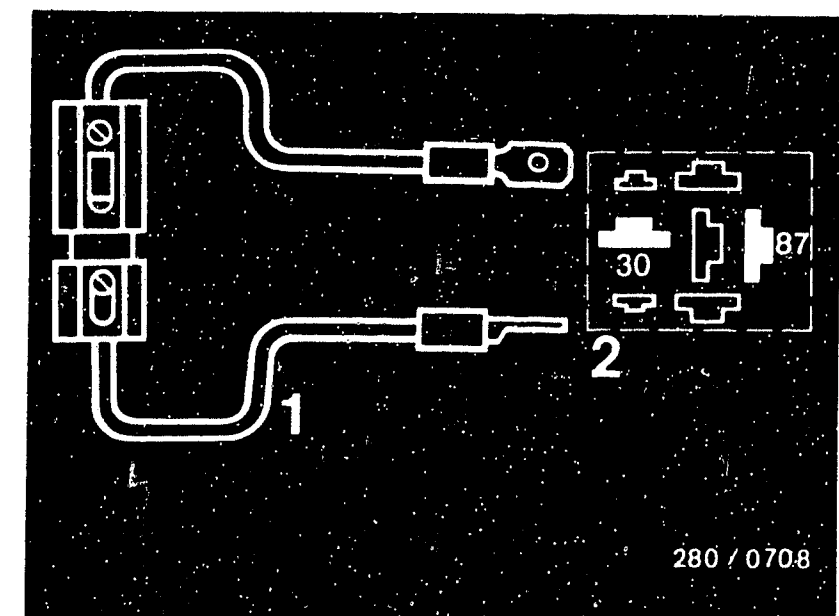
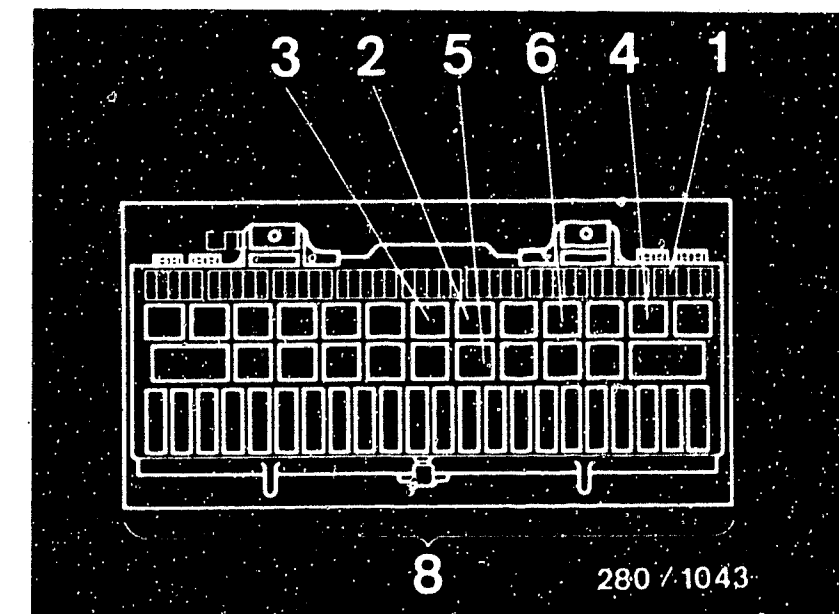
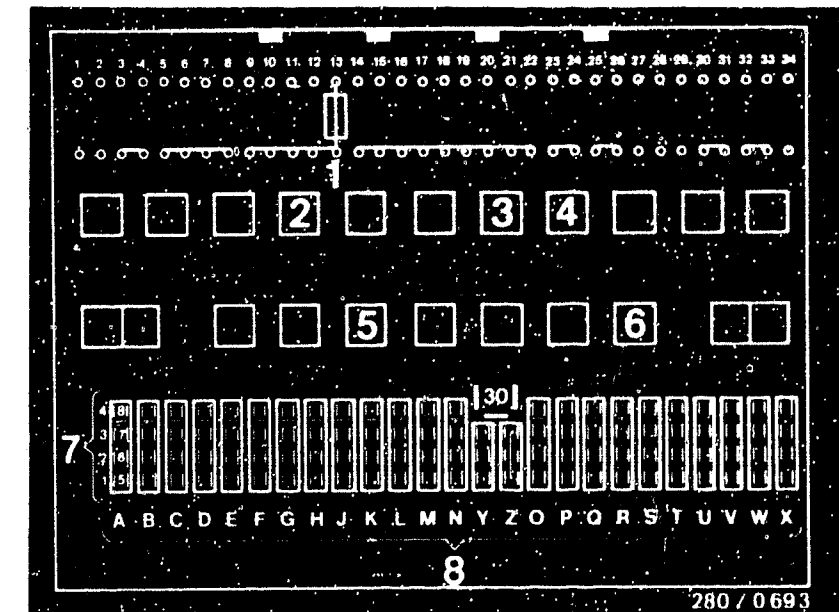
Switch off ignition. Remove jumper and re-insert pump relay (6).

Start engine and run. Fuel pressure drops to approx. 2.0 bar (dependent on intake-manifold pressure).

If not - trouble-shooting on pressure regulator.

yes

Continued on F11/F12



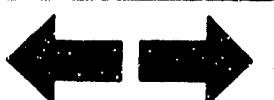
F9

Fuel pressure test
Porsche 928 S



F10

Fuel pressure test
Porsche 928 S



Fuel pressure test (continued)

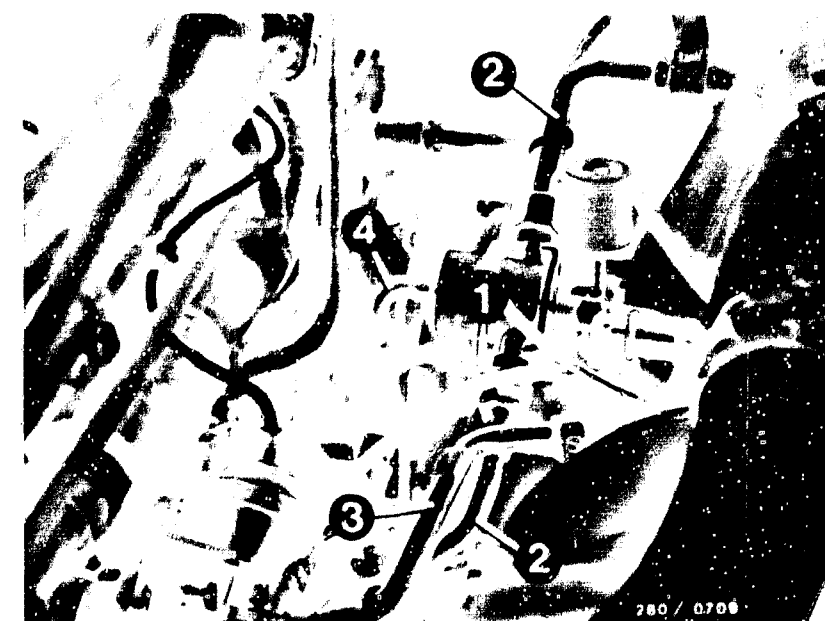
Fuel pressure O.K.?
Pressure regulator O.K.?
Test specification:
2.3...2.7 bar
Test specification reached?

no

- Testing the pressure regulator
Start engine and run.
Test specification for fuel pressure:
approx. 2.0 bar
Disconnect vacuum hose from left-hand pressure regulator.
Test specification for fuel pressure:
2.3...2.7 bar
Fuel pressure of 2.3 bar not reached:
 - Slowly pinch off common fuel delivery line.
Caution: Do not load pressure gauge above 6 bar.
If pressure rises above 4 bar - replace pressure regulator. Pressure regulator is mounted on fuel-distribution pipe by means of hose lines.
 - Fuel return line, fuel filter or pressure damper clogged.
 - Strainer in tank clogged.
 - Corrosion in tank.
- Fuel pressure of 2.7 bar exceeded:
- Fuel return line clogged or pinched.
 - Replace pressure regulator.

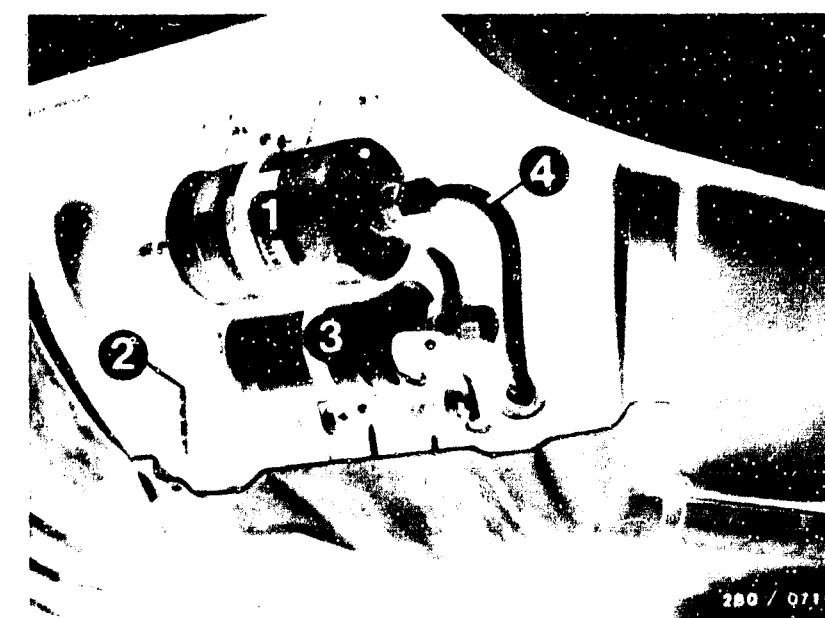
yes

Continued on F13/F14



- 1 = Pressure regulator
- 2 = Fuel delivery line
- 3 = Fuel return line
- 4 = Connection to intake manifold

- 1 = Fuel filter
- 2 = Fuel intake line
- 3 = Electric fuel pump
- 4 = Fuel delivery line



F11

Fuel pressure test
Porsche 928 S



F12

Fuel pressure test
Porsche 928 S



Fuel pressure test (continued)

Does fuel pressure remain almost constant after engine has been switched off?

Test specification:
2.3...2.7 bar

Test specification reached?

no

Fuel pressure drops quickly after the hot engine has been switched off.

- Check the fuel system for leaks (build up fuel pressure):
Fuel pressure: 2.3...2.7 bar

Remove jumper and watch pressure gauge.
After approx. 20 min the fuel pressure must still be min. 1.0 bar

If not:

- Check connections between components and fuel hoses/lines for leaks.
- Pressure regulator (diaphragm)
- Check injection valves (needle seat, valve not closing properly).
- Check electric fuel pump (leaking non-return valve - parts set 1 587 010 002)
- Pressure damper or fuel filter leaking.

yes

Remove pressure gauge. Connect screw plug onto fuel-distribution pipe (12 Nm).

Caution: Do not forget ball.

Remove jumper and insert pump relay into connection base.

The fuel pressure test is now completed.

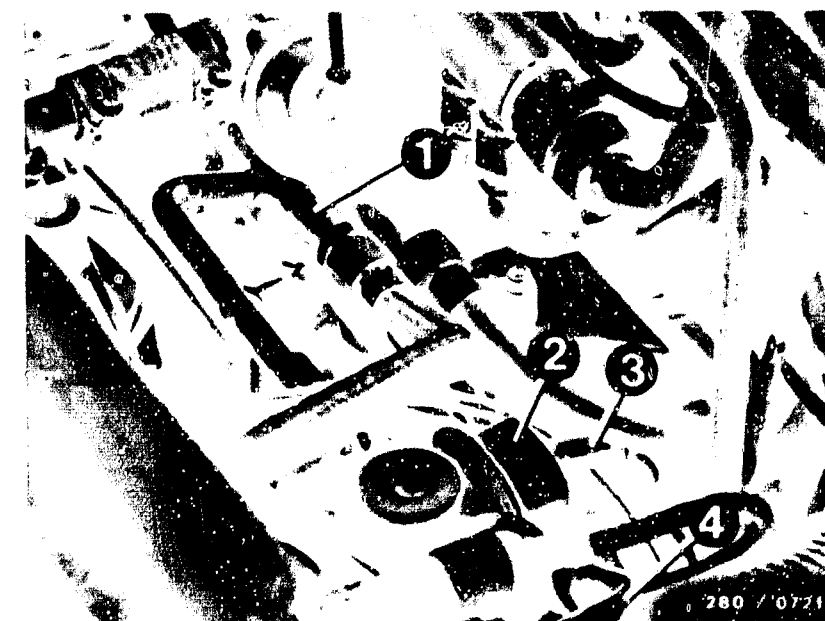
If the fault has not been found or if further instructions are required on how to remedy the fault, proceed according to the trouble-shooting chart of your choice.

Detailed trouble-shooting chart

(Coordinates C3...C4)

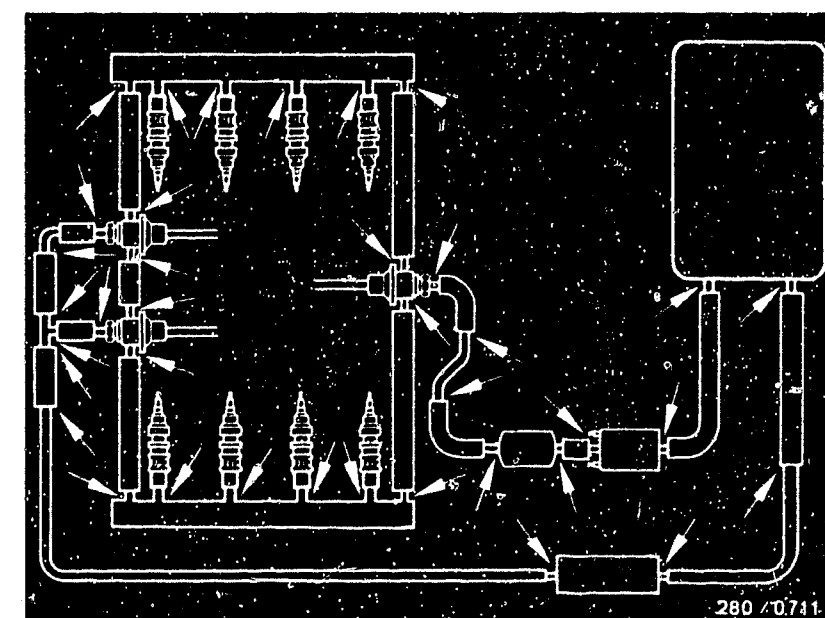
Direct trouble-shooting chart

(Coordinates C5...C8)



- 1 = Fuel return line
- 2 = Pressure regulator
- 3 = Connection to intake manifold
- 4 = Fuel delivery line

Diagram of fuel lines
Arrows indicate connections between hoses and components.



F13

Fuel pressure test

Porsche 928 S



F14

Fuel pressure test

Porsche 928 S



STARTING MOTOR OPERATES, ENGINE FAILS TO START OR STARTS ONLY WITH GREAT DIFFICULTY

Trouble-shooting program according to customer complaint

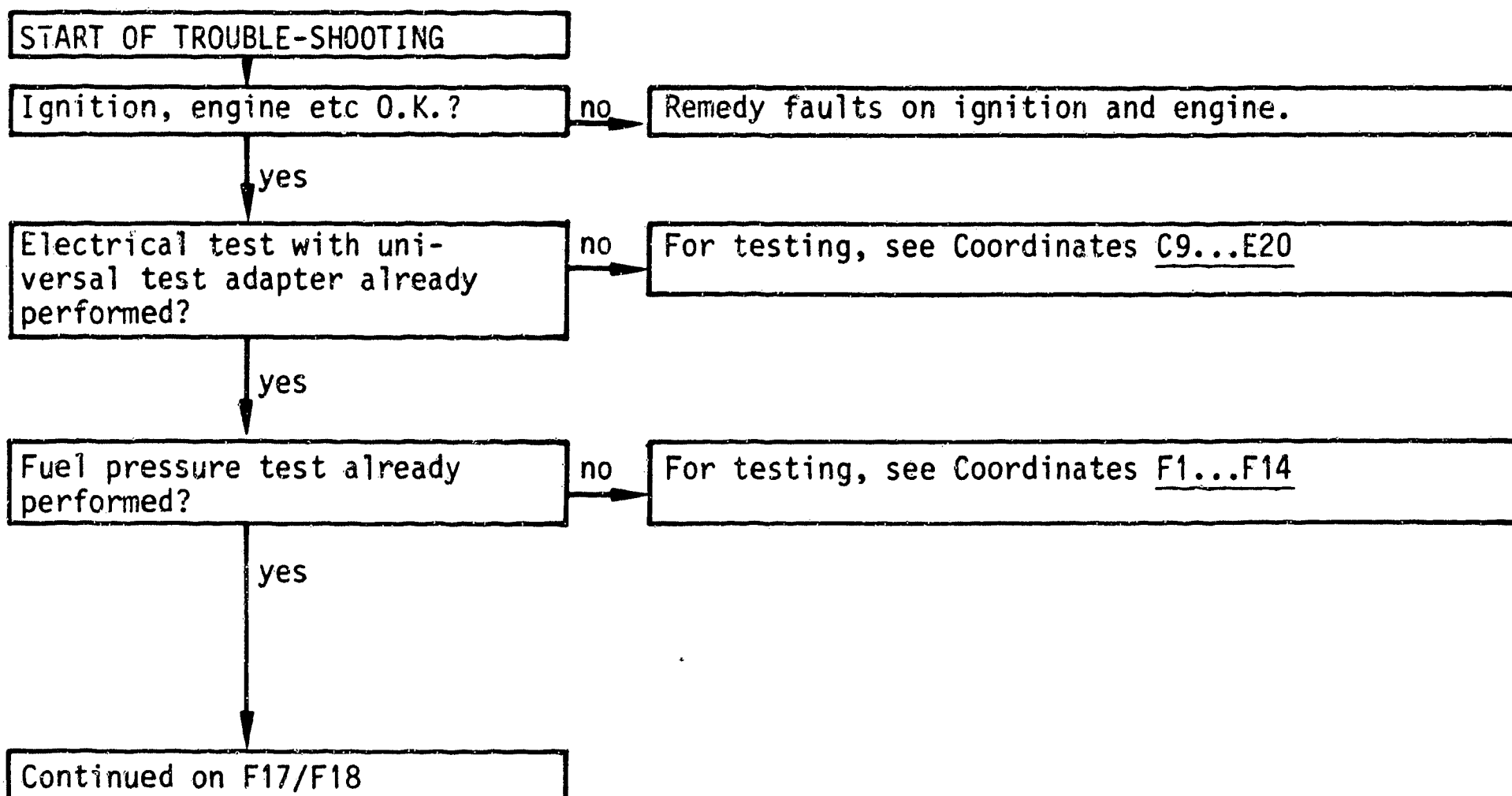
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row contains the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After the test has been completed, continue trouble-shooting at the point at which you branched off.



F15

Engine fails to start

Porsche 928 S



F16

Engine fails to start

Porsche 928 S



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Cold start control O.K.?
(Control unit function)

- Remove pump fuse (1) and unplug 2-pin plug-in connection above central-electrics box.
 - Connect test lead between an injection valve.
 - Disconnect plug from engine temperature sensor II (double NTC). Colour of plug blue.
 - Connect motortester/multimeter to test lead. (Setting V, measuring range 10 V).
- Start engine.
Voltage at injection valve must drop during starting from approx. 7 V to approx. 0.5 V (with engine at normal op. temp. or with NTC II plug connected, the voltage is less than 0.5 V). After testing, re-establish the original condition.

yes

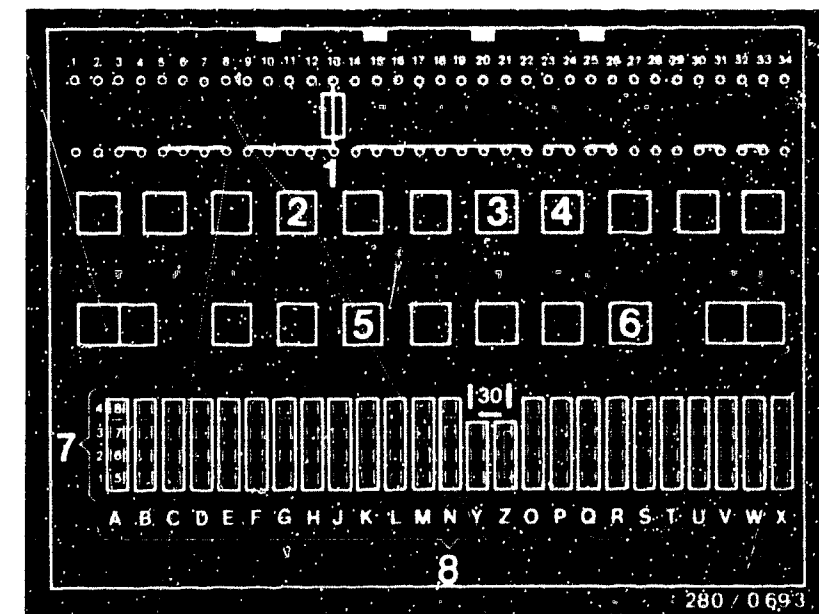
Continued on F21/F22

No

Functional test:

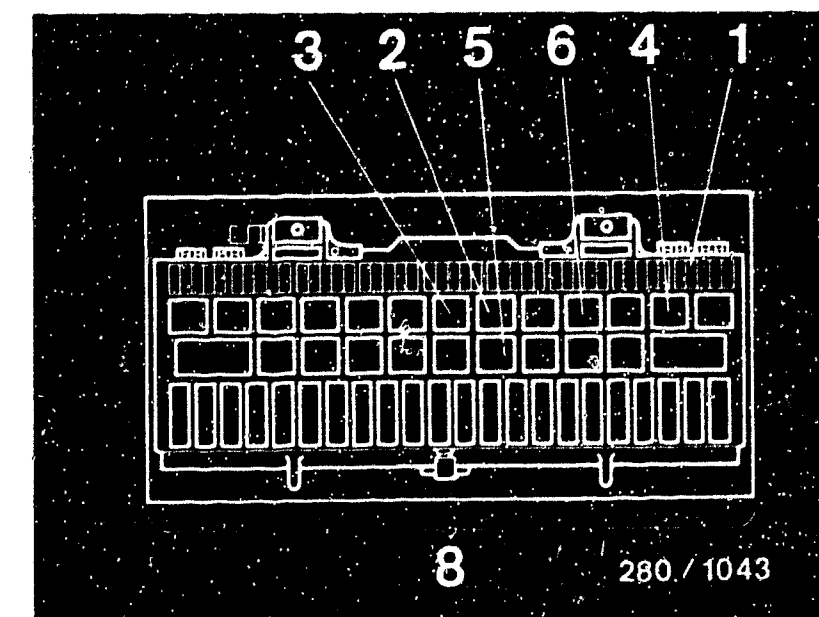
- Hinge up running plate (front passenger footwell cover plate behind the floor mat).
- Remove pump fuse (1)
up to 9.84: No. 13
as of 10.84: No. 42
- Unplug 2-pin plug-in connection above the central-electrics box. (Green and white shielded connecting leads).

Continued on F19/F20



Central-electrics box up to 9.84:
1 = Pump fuse (No. 13)

Central-electrics box as of 10.84:
1 = Pump fuse (No. 42)



F17

Engine fails to start
Porsche 928 S



F18

Engine fails to start
Porsche 928 S

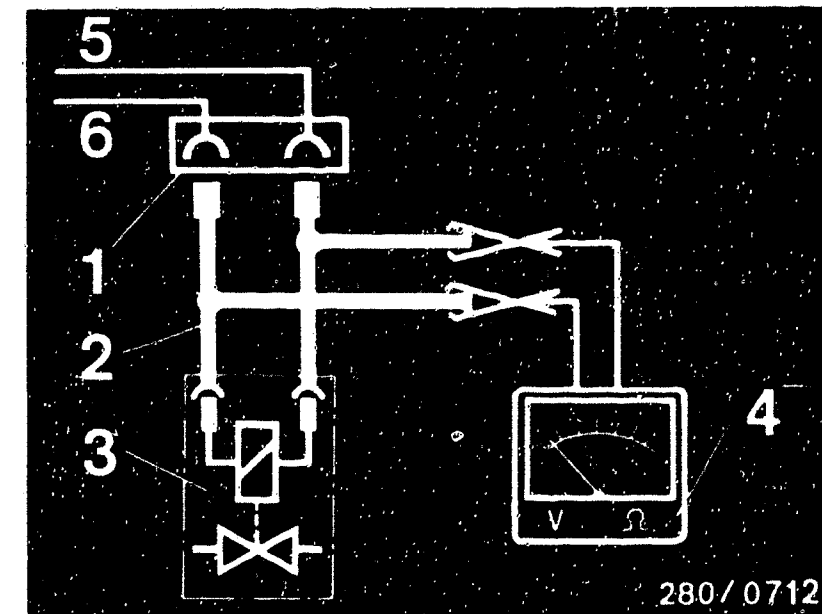


Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

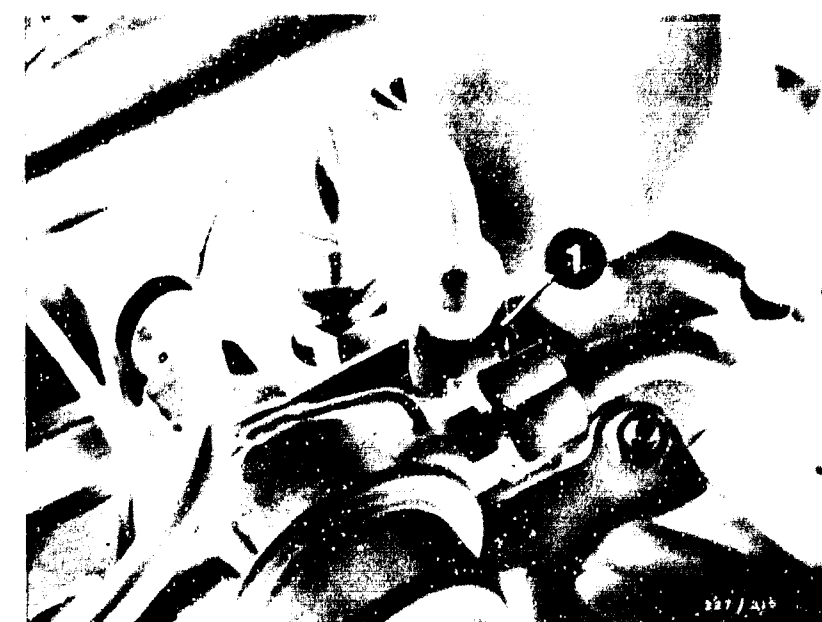
- Connect test lead 1 684 463 093.
Connect 2-pole test lead 1 684 463 093 between an injection valve and its electrical connecting lead.
- Connect multimeter to unoccupied measuring poles. Measuring range approx. 10 V.
- Disconnect plug from temperature sensor II (engine).
(Double NTC, colour of plug blue). Engine must not start while the starting motor is operated.
- Measuring:
 - Crank engine
 - Voltage reading drops from initially approx. 4 V within approx. 15 s cranking time to approx. 0.5 V. If voltage readings not obtained, replace control unit.
 - Wait approx. 1 minute before repeating test.
 - Connect plug to temperature sensor. If engine at normal operating temperature, start. Voltage reading less than 0.5 V. If voltage reading not as stated, replace temperature sensor II (double NTC).

Caution:
After testing, re-establish the original condition.



- 1 = Connector of injection valve lead
- 2 = Test lead 1 684 463 093
- 3 = Injection valve
- 4 = Multimeter/motortester
- 5 = From central-electrics box plug X No. 2 (W No. 13)
- 6 = From control unit term. 13

1 = Temperature sensor II



Continued on F21/F22

F19

Engine fails to start
Porsche 928 S



F20

Engine fails to start
Porsche 928 S



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Auxiliary-air device
mechanically O.K.?
Free cross section:
● cold - open?
● warm - closed?
● Does engine speed drop
when hose is pinched
off? (Engine cold).

no

Testing:

- Visual examination of auxiliary-air device
Disconnect hoses and look down (possibly
using a small mirror). When cold, the cross
section must be partially open; when the
engine is warm, it must be closed. If not, re-
place auxiliary-air device (arrow).
- Functional test of auxiliary-air device:
With the engine cold, pinch off hose to
auxiliary-air device. Engine speed must drop.
With the engine warm, pinch off hose to
auxiliary-air device. There must be no
noticeable drop in engine speed. If incorrect,
replace auxiliary-air device (pay attention to
the direction of flow).

Yes

Electrical operation of
auxiliary-air device (power
supply, ground lead, resis-
tance) O.K.?

no

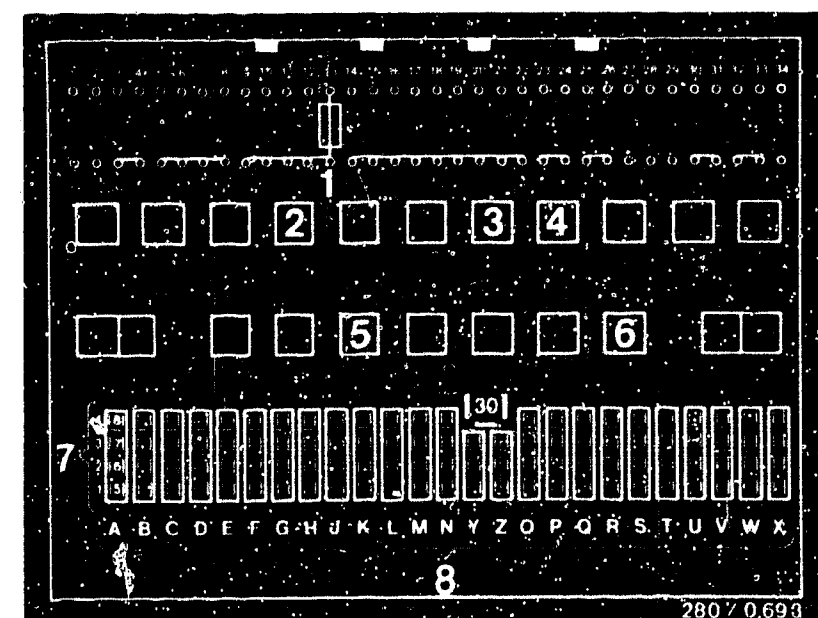
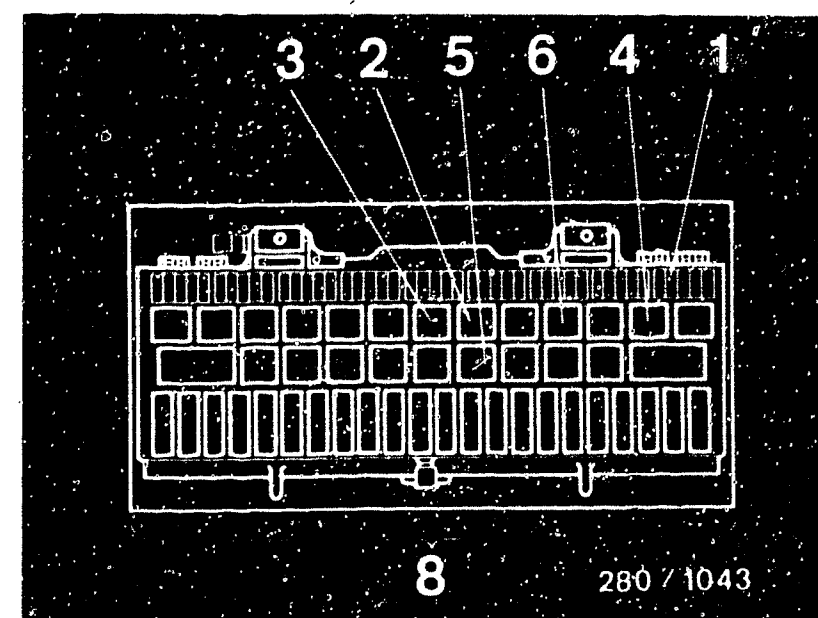
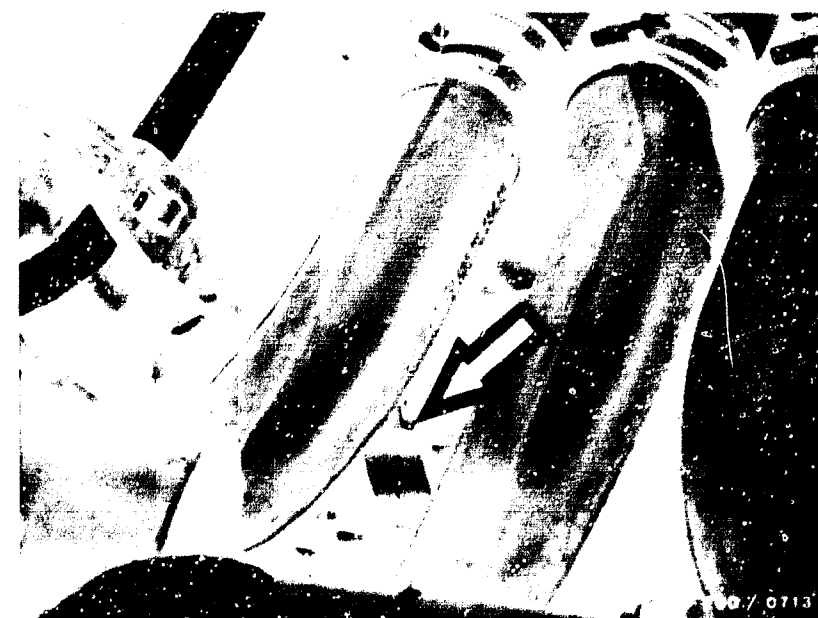
Start engine. (Values in parentheses apply to
central-electrics box as of 10.84 - center
picture).

- Voltage at plug min. 12 V. If not, check the
following leads for continuity (set value
approx. 0 Ω):
- From auxiliary-air device connection to
engine-compartment plug no. 7 (in engine com-
partment, center right, above ignition coil).
From engine-compartment plug no. 7 to central-
electrics box plug Q No. 1 (Q No. 14). From
Q No. 1 to central-electrics box plug T No. 5.
From T No. 5 (Q No. 14) to pump fuse (Item 1)
No. 13 (No. 42) (positive supply).
- Ground connection (right-hand toothed-belt
cover on camshaft housing).

yes

Continued on F23/F24

Continued on F23/F24



F21

Engine fails to start
Porsche 928 S



F22

Engine fails to start
Porsche 928 S



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Hot-wire air-mass sensor
mechanically and elec-
trically O.K.?

- Hot wire not broken?
- Resistance values within tolerance?
Between term. 6 and term. 3:
 $0...1100\ \Omega$
Between term. 5 and term. 3:
 $3.6...4.1\ \Omega$

no

yes

Continued on G3/G4

- Resistance at auxiliary-air device
 $10...45\ \Omega$:
If the resistance is not within tolerance, re-
place auxiliary-air device. (Check idle speed).

Removal

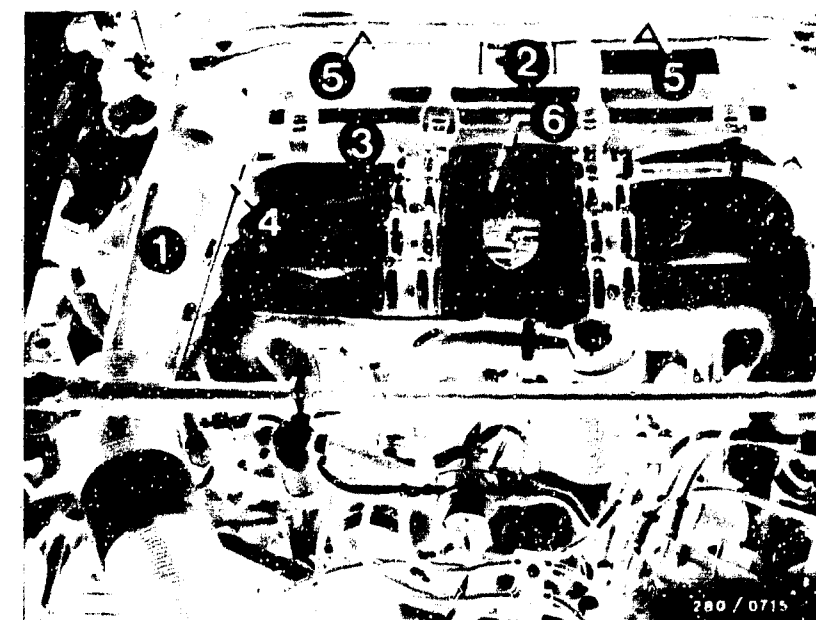
- Remove left-hand and right-hand air intake hoses.
- Loosen rubber bands on air filter and lift off top part
- Loosen hose from blow-off change-over valve to right-hand part of lower half of air filter housing.
- Loosen 2 hexagon screws A/F 13 in bottom part of air filter housing.
- Remove bottom part of housing with hot-wire air-mass sensor.

Warning: Withdraw bottom part of air filter housing and hot-wire air-mass sensor slowly from the intake manifold fitting. Do not lose O-ring (in fitting) and O-ring (dust protection).

Visual examination

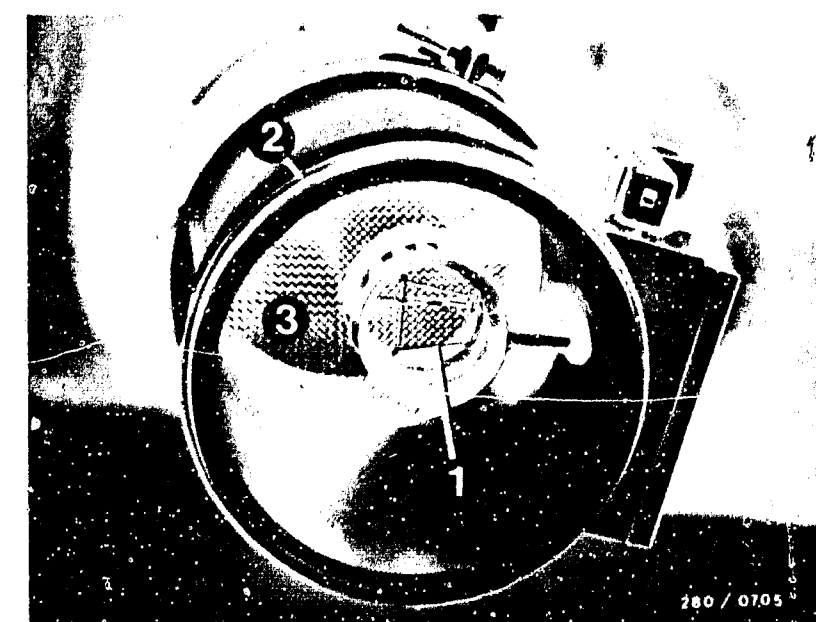
- Plug correctly connected.
- Spring retainer snapped in position.
- Plug not turned round.
- No pins pushed back or poor contact. Make sure that seal is correctly seated in plug.
- Wire screen O.K. on both sides?
If hot wire broken - replace hot-wire air-mass sensor.

Continued on G1/G2



- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor

- 1 = Hot wire
- 2 = O-ring (dust protection)
- 3 = Wire screen



F23

Engine fails to start
Porsche 928 S



F24

Engine fails to start
Porsche 928 S



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

● Electrical test

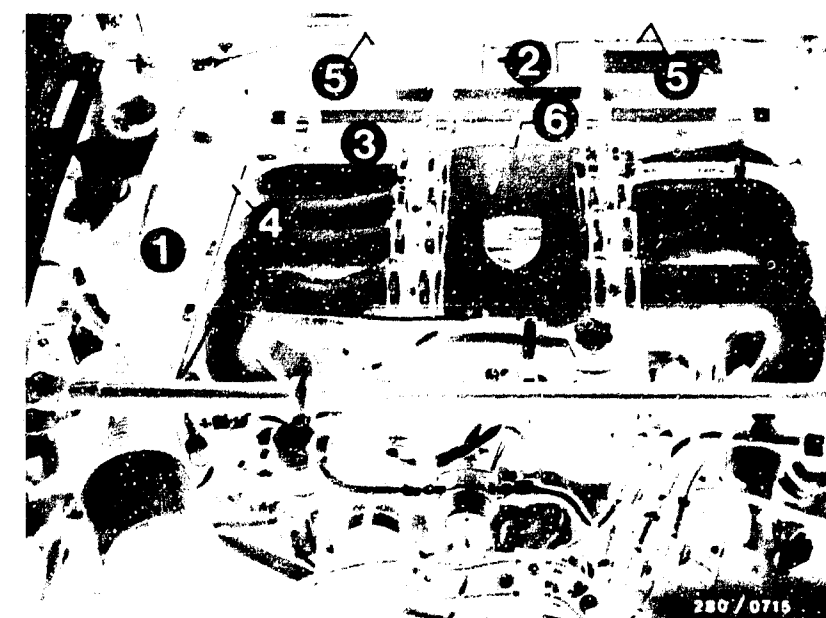
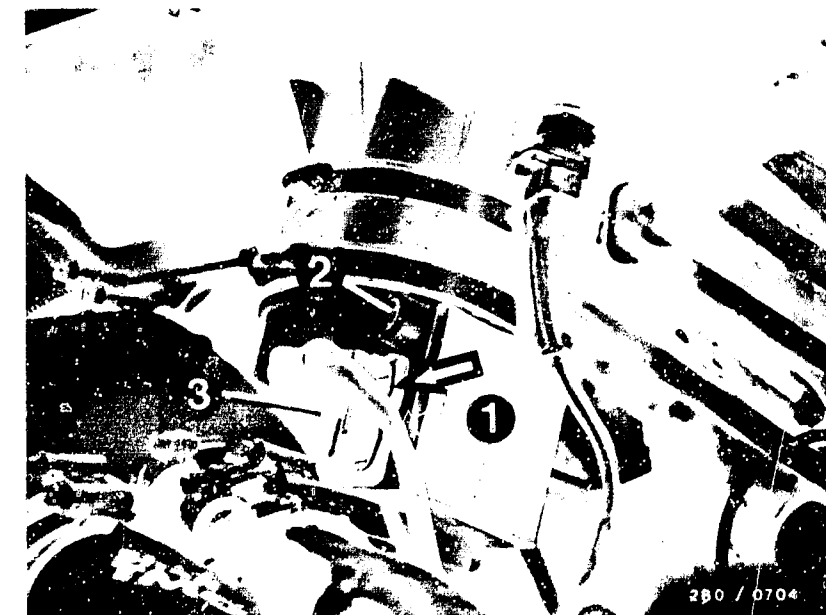
- Disconnect plug. Set multimeter/motortester to Ω range.
Resistance measurement
between term. 6 and term. 3:
0...1100 Ω
between term. 5 and term. 3:
3.6...4.1 Ω
If incorrect, replace hot-wire air-mass sensor.

Installation

- Connect plug to hot-wire air-mass sensor (right way round).
- Lightly grease O-ring in fitting (use acid-free grease).
Ensure correct position of O-ring.
- Provide idle-mixture-adjusting screw with red plug 1 280 508 012.
- Carefully press bottom part of air filter housing with hot-wire air-mass sensor into intake manifold fitting. When mounting, pay attention to position and leak-tightness of O-ring and to accessibility of idle-mixture-adjusting screw when installed.
- Fasten bottom part of air filter housing with both hexagon screws (A/F 13).
- Re-fasten hose from blow-off change-over valve on bottom part of air filter housing.
- Assemble air filter and fasten with rubber bands.
- Correctly connect air intake hoses.

1 = Hot-wire air-mass sensor
3 = Plug
Press retainer in direction of arrow when disconnecting plug

1 = Intake hose
2 = Air-filter housing top part
3 = Air-filter housing bottom part
4 = Hose to blow-off change-over valve
5 = Hexagon screws
6 = Hot-wire air-mass sensor



Continued on G3/G4

G1

Engine fails to start
Porsche 928 S



G2

Engine fails to start
Porsche 928 S



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Engine not coughing during starting?

Idle speed:
 $700 \dots 750 \text{ min}^{-1}$

CO concentration
(with engine at normal
operating temperature):
 $0.5 \dots 1.5 \text{ vol. \% CO}$
(Australia, Sweden,
Switzerland version
 $0.5 \dots 1.0 \text{ vol. \% CO}$)

(CO adjustment with second-
ary-air injection dis-
connected).

Idle speed and CO concen-
tration correctly ad-
justed?

yes

Continued on G7/G8

no

Idle speed and CO adjustment

• Idle speed (adjusting)

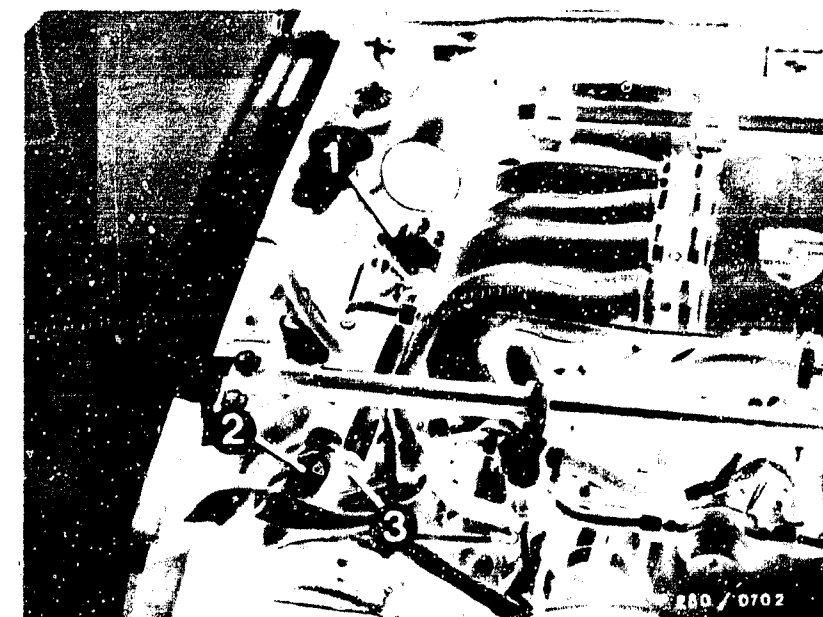
Requirement: The adjusting operations must be performed as quickly as possible so that the intake passages do not heat up, thereby falsifying the CO reading.

- Take off right-hand air intake hose.
- Pull off hose to air pump.
- Seal off pipe to blow-off change-over valve (e.g. rubber sleeve from the door Porsche Part No. 999. 703. 163. 40).
- Re-mount right-hand air intake hose.
- Bring engine to normal operating temperature.
- Connect motortester and exhaust-gas analyzer.
- Turn idle-air screw on throttle-valve assembly until checking and setting value:
 $700 \dots 750 \text{ min}^{-1}$

is obtained.

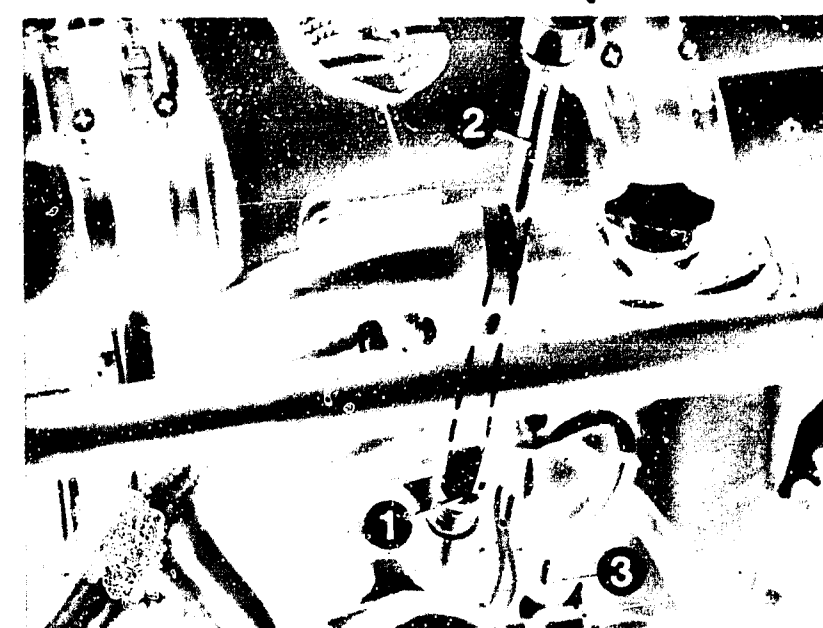
Caution: Idle speed must not drop below 700 min^{-1} since otherwise the ignition timing is changed.

Continued on G5/G6



- 1 = Blow-off change-over valve
- 2 = Hose to air pump
- 3 = Rubber sleeve

- 1 = Idle air screw for engine-speed adjustment
- 2 = Screwdriver
- 3 = Temperature sensor (double NTC)



G3

Engine fails to start
Porsche 928 S



G4

Engine fails to start
Porsche 928 S



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

• CO concentration

Adjusting:

Introduce special Porsche tool 9187 into the hexagon-socket-head cap screw A/F 3 of the air-mass sensor and turn the potentiometer appropriately for the idle mixture adjustment.

- Switch off exhaust extractor while measuring. Observe safety regulations.

Checking and setting value:

0.5...1.5 vol. % CO

(Australia, Sweden, Switzerland version:

0.5...1.0 vol. % CO)

The Porsche 928 S is equipped as of 8.83 with secondary-air injection. Therefore, the above-explained procedure must be adopted for adjusting the idle speed and the CO concentration.

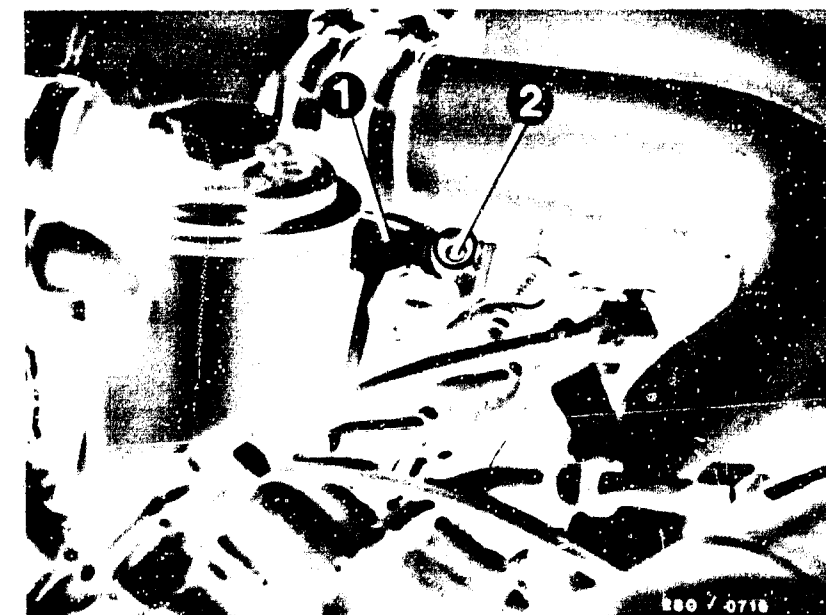
For all vehicles:

If CO concentration too high, turn CO adjusting screw in hot-wire air-mass sensor half a turn in a counterclockwise direction (hexagon-socket-head cap screw A/F 3 mm). Check idle speed and CO concentration again. If necessary, make corrections in several steps. After adjusting, use new, red plug (1 280 508 012).

Caution: Remove plug from air line and connect hose. Re-connect air intake hose if previously disconnected.

yes

Continued on G7/G8

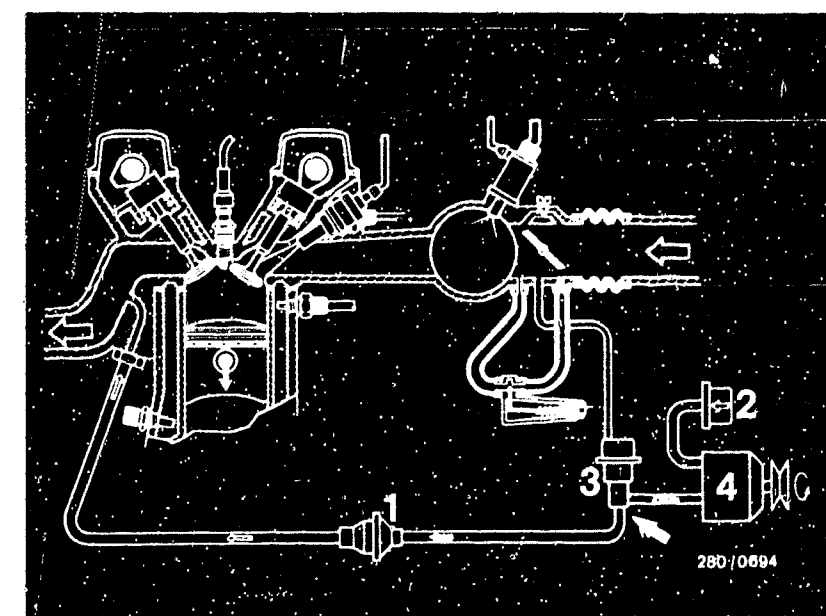


- 1 = Hot-wire air-mass sensor
- 2 = Mixture-adjusting screw

- 1 = Non-return valve
- 2 = Air filter for air pump
- 3 = Blow-off change-over valve
- 4 = Air pump

Arrow = Seal outlet.

On the 928 S, seal air line from air pump to blow-off change-over valve.



G5

Engine fails to start

Porsche 928 S



G6

Engine fails to start

Porsche 928 S



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Visual examination:
All hose lines correctly
connected, not kinked or
damaged?

- Air-intake system checked
for leaks with 0.3 bar
gauge pressure?

no

- Check whether hoses of air-intake system and
of fuel line system are correctly connected,
not kinked or damaged. If necessary, replace
hoses. Eliminate leaks by means of new seals
or by re-tightening the connecting screws.

Leak test

• Preparations

- Remove left-hand and right-hand air intake
hoses.
- Loosen rubber bands on air filter and lift
off top part of air filter.
- Loosen hose from blow-off change-over valve
to right-hand part of lower half of air filter
housing.
- Loosen 2 hexagon screws A/F 13 in bottom part
of air-filter housing.
- Remove bottom part of housing with hot-wire
air-mass sensor.

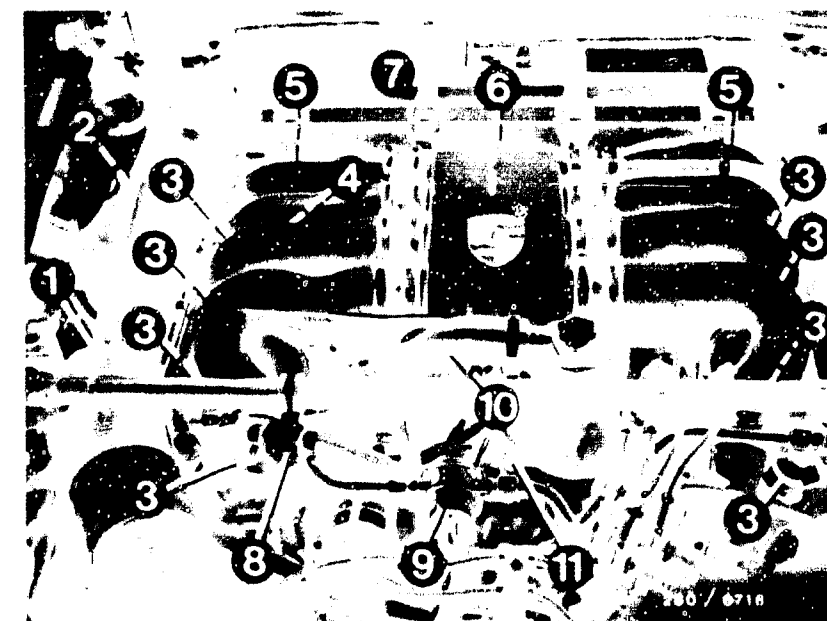
Warning: Withdraw bottom part of air filter
housing and hot-wire air-mass sensor slowly
from the intake manifold fitting. Do not
lose O-ring in fitting and O-ring (dust pro-
tection on hot-wire air-mass sensor).

- Loosen hot-wire air-mass sensor from bottom
part of air filter housing and seal the air
inlet opening e.g. with dust-protection
cover of pack).
- Re-mount bottom part of air filter housing
on hot-wire air-mass sensor.
- Disconnect both hoses from auxiliary-air
device and seal off tight the hose to the in-
take manifold.
- Mount bottom part of air filter housing with
the 2 hexagon screws A/F 13.

yes

Continued on G9/G10

Continued on G9/G10



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

G7

Engine fails to start
Porsche 928 S



G8

Engine fails to start
Porsche 928 S



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Trouble-shooting program
completed for customer
complaint

"Starting motor operates,
engine fails to start or
starts only with great
difficulty".

Fault eliminated?

no

● Testing

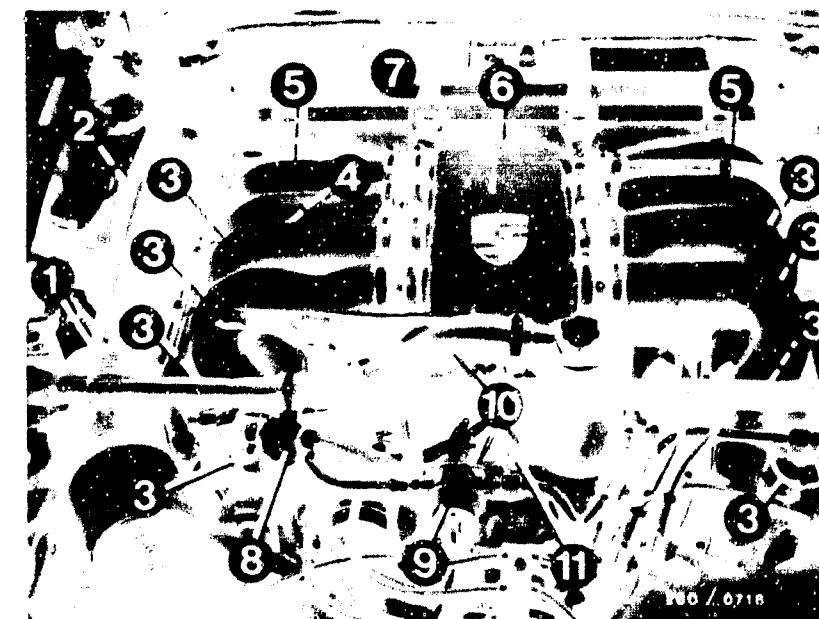
- Blow air (0.3 bar gauge pressure) into the intake manifold with compressed-air gun.
- Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Leaks may also occur at the following points on the engine:
- Oil dipstick not securely inserted.
- Defective cap seal on oil filler neck.
- O-ring in intake manifold fitting leaking etc.
- Bubbling or foaming indicates a leak.

● Installation

Install in the reverse sequence to removal. Lightly grease O-ring in intake manifold fitting (acid-free grease). Remove dust-protection cover. Re-establish the original condition.

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If the fault has not been detected with the "direct trouble-shooting chart", see "detailed trouble-shooting chart" (Coordinates C3...C4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

G9

Engine fails to start

Porsche 928 S



G10

Engine fails to start

Porsche 928 S



ENGINE STARTS BUT THEN DIES

Trouble-shooting program according to customer complaint

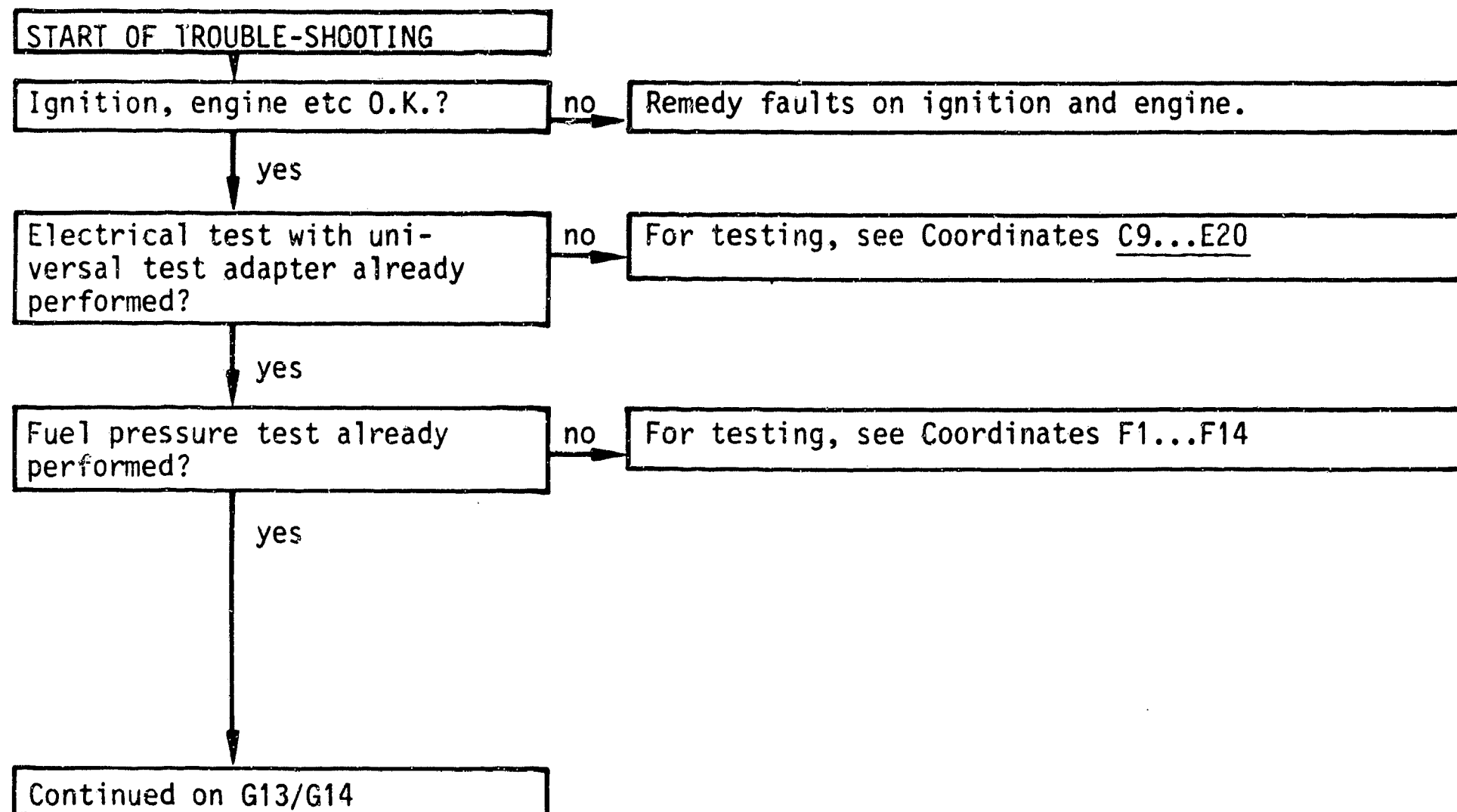
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row contains the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After the test has been completed, continue trouble-shooting at the point at which you branched off.



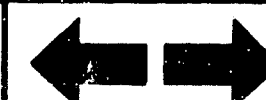
G11

Engine starts but then dies
Porsche 928 S



G12

Engine starts but then dies
Porsche 928 S



Engine starts but then dies (continued)

yes

Auxiliary-air device mechanically O.K.?
Free cross section:
● cold - open?
● warm - closed?
● Does engine speed drop when hose is pinched off? (Engine cold).

no

Testing:

- Visual examination of auxiliary-air device
Disconnect hoses and look down (possibly using a small mirror). When cold, the cross section must be partially open; when the engine is warm, it must be closed. If not, replace auxiliary-air device (arrow).
- Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. There must be no noticeable drop in engine speed. If incorrect, replace auxiliary-air device (pay attention to the direction of flow).

yes

Electrical operation of auxiliary-air device (power supply, ground lead, resistance) O.K.?

no

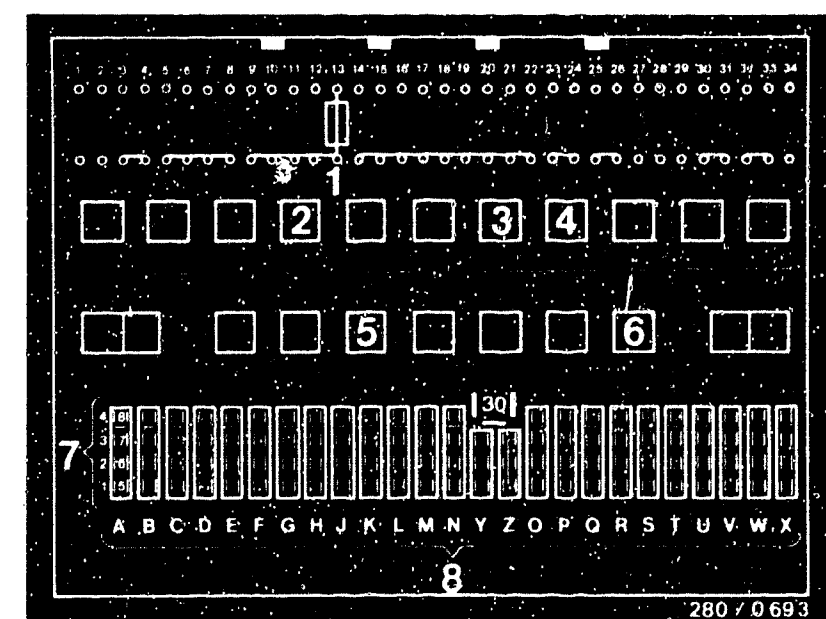
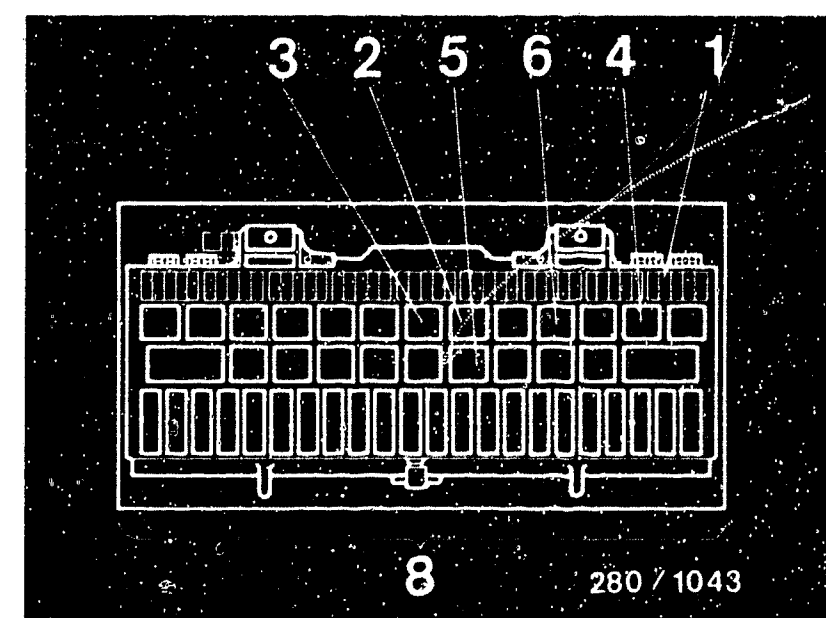
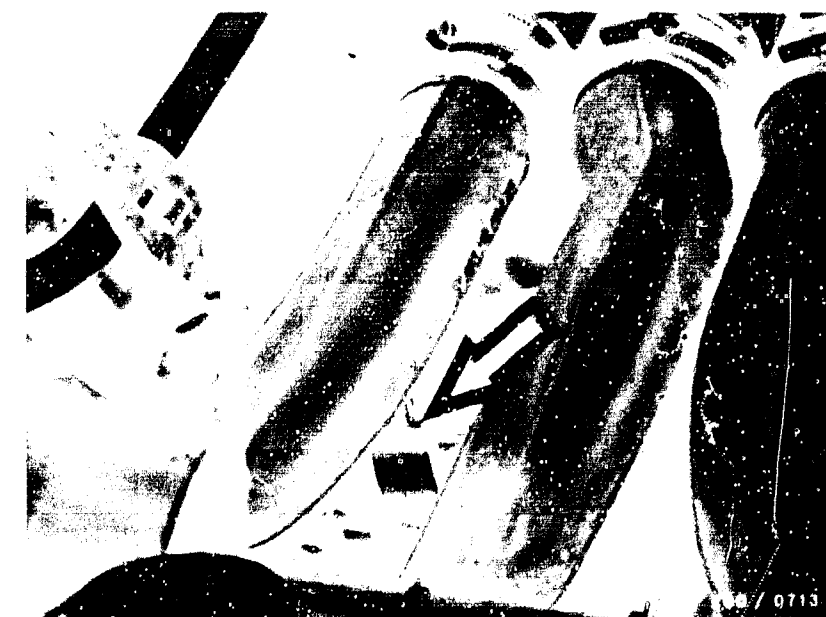
Start engine. (Values in parentheses apply to central-electrics box as of 10.84 - center picture).

- Voltage at plug min. 12 V. If not, check the following leads for continuity (set value approx. 0 Ω):
- From auxiliary-air device connection to engine-compartment plug no. 7 (in engine compartment, center right, above ignition coil). From engine-compartment plug no. 7 to central-electrics box plug Q No. 1 (Q No. 14). From Q No. 1 to central-electrics box plug T No. 5. From T No. 5 (Q No. 14) to pump fuse (Item 1) No. 13 (No. 42) (positive supply).
- Ground connection (right-hand toothed-belt cover on camshaft housing).

yes

Continued on G15/G16

Continued on G15/G16



G13

Engine starts but then dies
Porsche 928 S



G14

Engine starts but then dies
Porsche 928 S



Engine starts but then dies (continued)

yes

Hot-wire air-mass sensor mechanically and electrically O.K.?

- Hot wire not broken?
- Resistance values within tolerance?
Between term. 6 and term. 3:
 $0...1100\ \Omega$
Between term. 5 and term. 3:
 $3.6...4.1\ \Omega$

no

- Resistance at auxiliary-air device
 $10...45\ \Omega$:
If the resistance is not within tolerance, replace auxiliary-air device. (Check idle speed).

Removal

- Remove left-hand and right-hand air intake hoses.
 - Loosen rubber bands on air filter and lift off top part
 - Loosen hose from blow-off change-over valve to right-hand part of lower half of air filter housing.
 - Loosen 2 hexagon screws A/F 13 in bottom part of air filter housing.
 - Remove bottom part of housing with hot-wire air-mass sensor.
- Warning:** Withdraw bottom part of air filter housing and hot-wire air-mass sensor slowly from the intake manifold fitting. Do not lose O-ring (in fitting) and O-ring (dust protection).

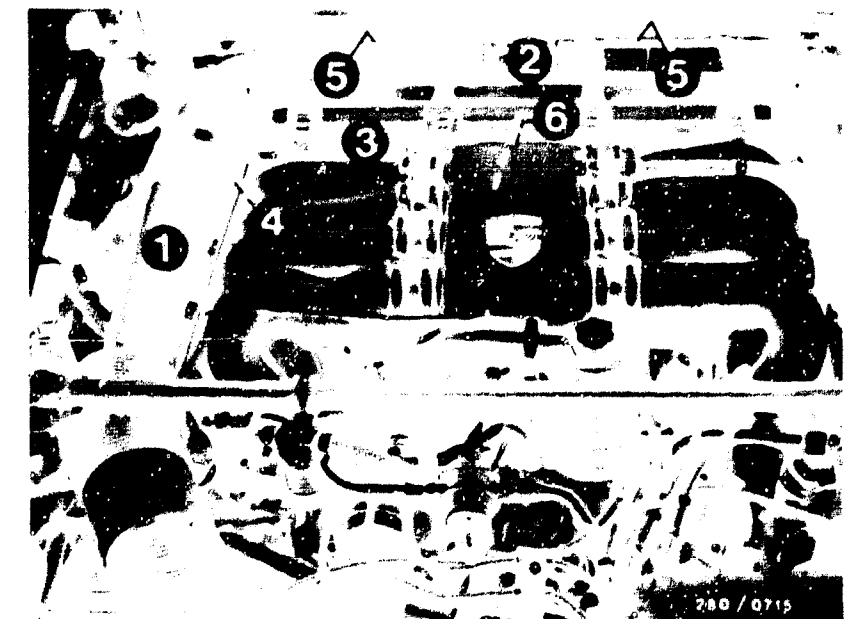
Visual examination

- Plug correctly connected.
- Spring retainer snapped in position.
- Plug not turned round.
- No pins pushed back or poor contact. Make sure that seal is correctly seated in plug.
- Wire screen O.K. on both sides?
If hot wire broken- replace hot-wire air-mass sensor.

yes

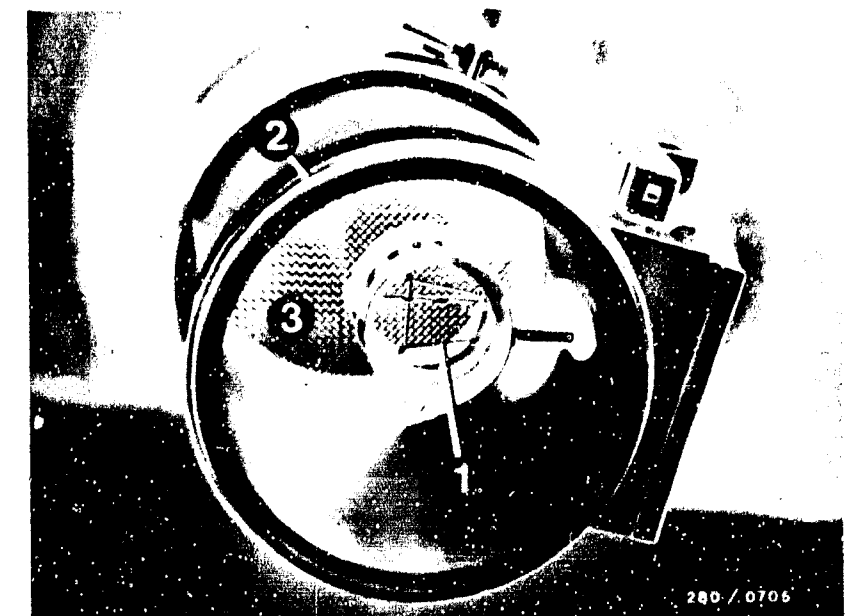
Continued on G19/G20

Continued on G17/G18



- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor

- 1 = Hot wire
- 2 = O-ring (dust protection)
- 3 = Wire screen



G 15

Engine starts but then dies
Porsche 928 S



G 16

Engine starts but then dies
Porsche 928 S



Engine starts but then dies (continued)

yes

• Electrical test

- Disconnect plug. Set multimeter/motortester to Ω range.

Resistance measurement

between term. 6 and term. 3:

0...1100 Ω

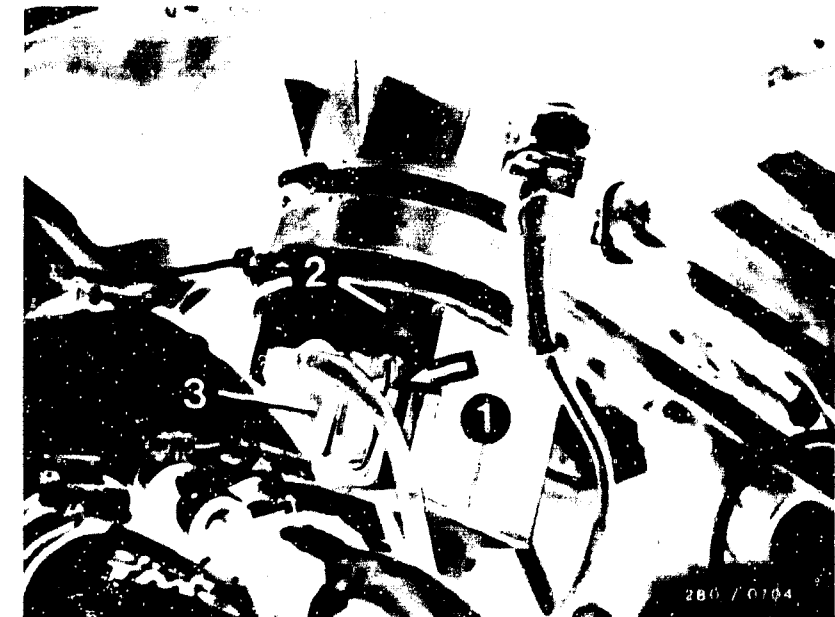
between term. 5 and term. 3:

3.6...4.1 Ω

If incorrect, replace hot-wire air-mass sensor.

Installation

- Connect plug to hot-wire air-mass sensor (right way round).
- Lightly grease O-ring in fitting (use acid-free grease).
Ensure correct position of O-ring.
- Provide idle-mixture-adjusting screw with red plug 1 280 508 012.
- Carefully press bottom part of air filter housing with hot-wire air-mass sensor into intake manifold fitting. When mounting, pay attention to position and leak-tightness of O-ring and to accessibility of idle-mixture-adjusting screw when installed.
- Fasten bottom part of air filter housing with both hexagon screws (A/F 13).
- Re-fasten hose from blow-off change-over valve on bottom part of air filter housing.
- Assemble air filter and fasten with rubber bands.
- Correctly connect air intake hoses.



1 = Hot-wire air-mass sensor

3 = Plug

Press retainer in direction of arrow when disconnecting plug

1 = Intake hose

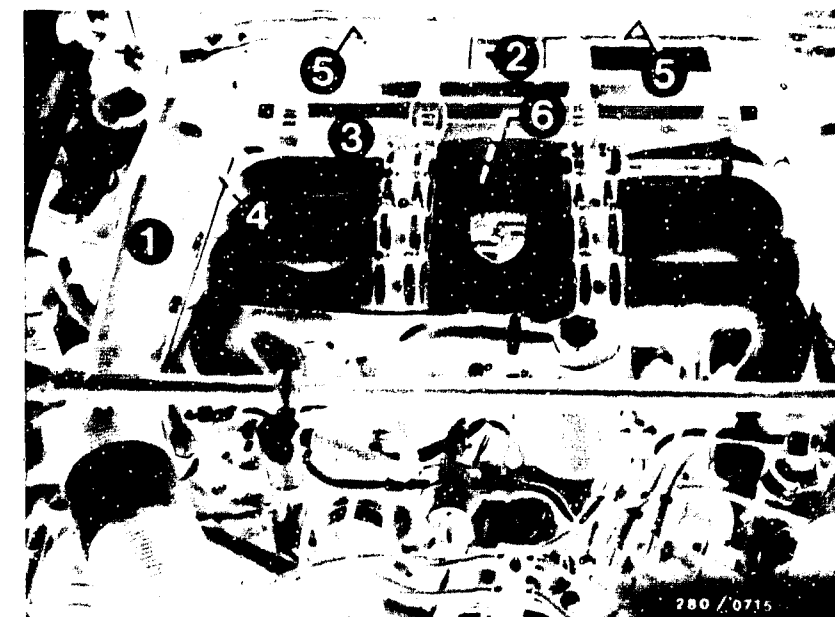
2 = Air-filter housing top part

3 = Air-filter housing bottom part

4 = Hose to blow-off change-over valve

5 = Hexagon screws

6 = Hot-wire air-mass sensor



Continued on G19/G20

G17

Engine starts but then dies

Porsche 928 S



G18

Engine starts but then dies

Porsche 928 S



Engine starts but then dies (continued)

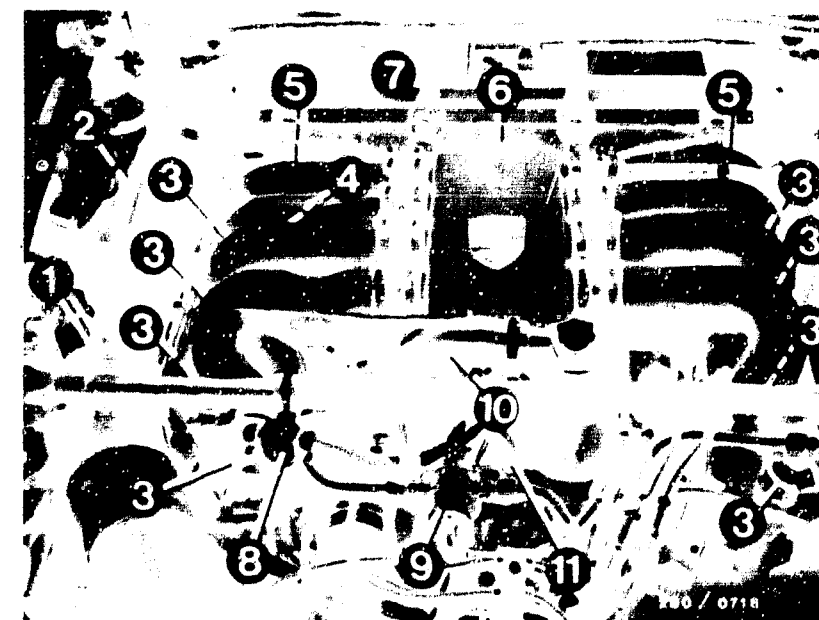
Solenoid-operated injection valves leak-tight?

no

yes

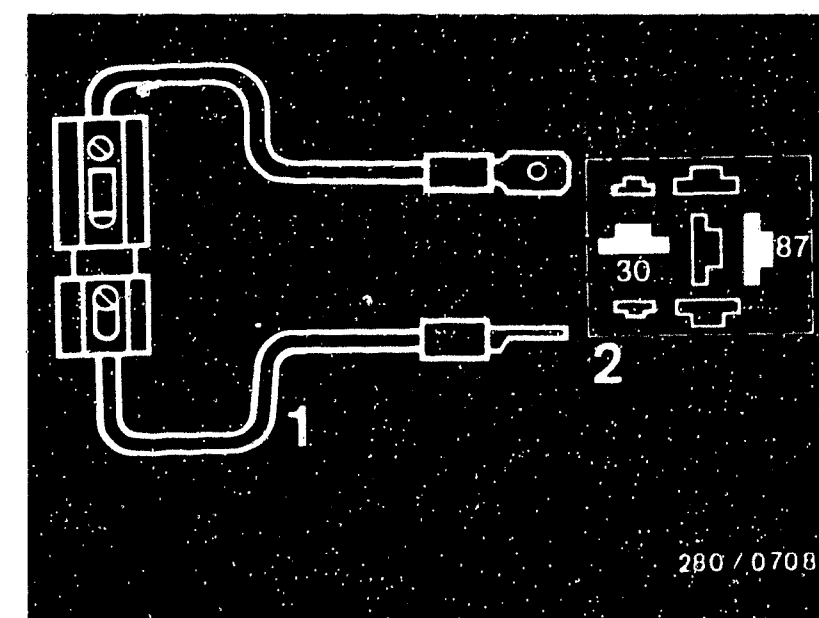
- Leak test on solenoid-operated injection valves
- Remove fuel-distribution pipes with solenoid-operated injection valves:
Loosen fastening screws on fuel-distribution pipe and injection valves. Pull all 8 injection valves simultaneously and carefully out of the cylinder head.
Build up fuel pressure:
Jump safety circuit.
Caution:
Make sure that no fuel gets onto hot parts of the engine.
Test specification:
Within 60 seconds no drop may fall from the mouth of the injection valve. If incorrect, replace injection valve.
- Removal
 - Pull off electrical connection.
 - Break open hose-termination sleeve on fuel-distribution pipe.
 - Cut open hose in longitudinal direction with soldering iron and remove injection valve.Caution: Catch any escaping fuel. Do not allow to drip onto hot parts of the engine.
Warning: Before installing, grease the rubber seals on the valve mouth sleeve only lightly (silicone grease F T 2 v 1). The other injection valve parts must remain grease-free.
- Installation
 - Put on hose-termination sleeve (fuel-distribution pipe).
 - Plug on injection valve (check joints for leaks).Caution: After testing the injection valves and the fuel-distribution pipes, re-establish the original condition. Check for leaks (unmetered air).

Continued on G21/G22



3 = Injection valves

1 = Jumper with fuse holder and 10 A fuse (user-fabricated)
2 = Top view of connection base



G19

Engine starts but then dies
Porsche 928 S



G20

Engine starts but then dies
Porsche 928 S



Engine starts but then dies (continued)

yes

All hose lines correctly connected, not kinked or damaged?

- Air-intake system checked for leaks with 0.3 bar gauge pressure?

no

- Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.

Leak test

• Preparations

- Remove left-hand and right-hand air intake hoses.
- Loosen rubber bands on air filter and lift off top part of air filter.
- Loosen hose from blow-off change-over valve to right-hand part of lower half of air filter housing.
- Loosen 2 hexagon screws A/F 13 in bottom part of air-filter housing.
- Remove bottom part of housing with hot-wire air-mass sensor.

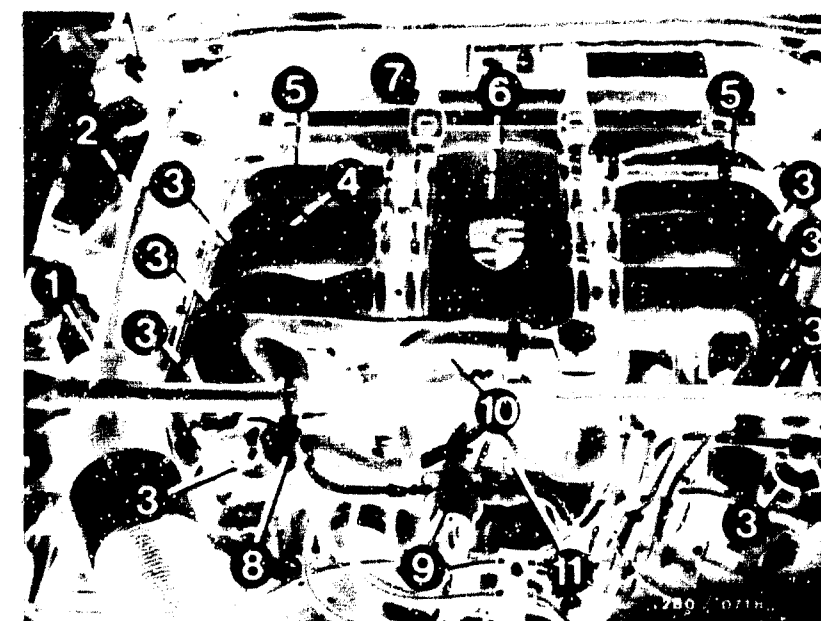
Warning: Withdraw bottom part of air filter housing and hot-wire air-mass sensor slowly from the intake manifold fitting. Do not lose O-ring in fitting and O-ring (dust protection on hot-wire air-mass sensor).

- Loosen hot-wire air-mass sensor from bottom part of air filter housing and seal the air inlet opening e.g. with dust-protection cover of pack).
- Re-mount bottom part of air filter housing on hot-wire air-mass sensor.
- Disconnect both hoses from auxiliary-air device and seal off tight the hose to the intake manifold.
- Mount bottom part of air filter housing with the 2 hexagon screws A/F 13.

yes

Continued on G23/G24

Continued on G23/G24



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

G21

Engine starts but then dies
Porsche 928 S



G22

Engine starts but then dies
Porsche 928 S



Engine starts but then dies (continued)

Yes

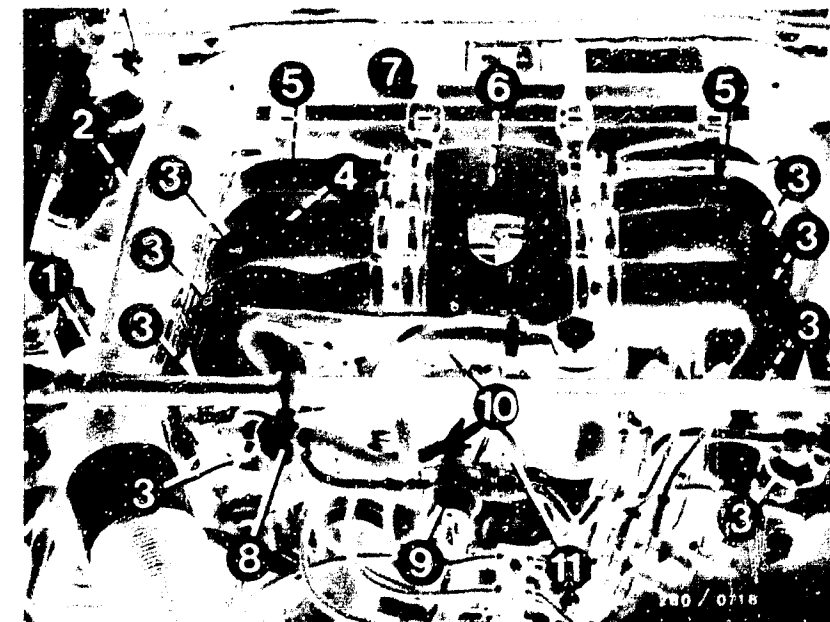
- **Testing**
 - Blow air (0.3 bar gauge pressure) into the intake manifold with compressed-air gun.
 - Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Leaks may also occur at the following points on the engine:
 - Oil dipstick not securely inserted.
 - Defective cap seal on oil filler neck.
 - O-ring in intake manifold fitting leaking etc.
 - Bubbling or foaming indicates a leak.
- **Installation**

Install in the reverse sequence to removal. Lightly grease O-ring in intake manifold fitting (acid-free grease). Remove dust-protection cover. Re-establish the original condition.

Trouble-shooting program completed for customer complaint
"Engine starts but then dies".
Fault eliminated?

no

- Further possibilities:**
- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If the fault has not been detected with the "direct trouble-shooting chart", see "detailed trouble-shooting chart" (Coordinates C3...C4).
 - Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

G23

Engine starts but then dies
Porsche 928 S



G24

Engine starts but then dies
Porsche 928 S



ROUGH IDLE; INCORRECT IDLE SPEED

Trouble-shooting program according to customer complaint

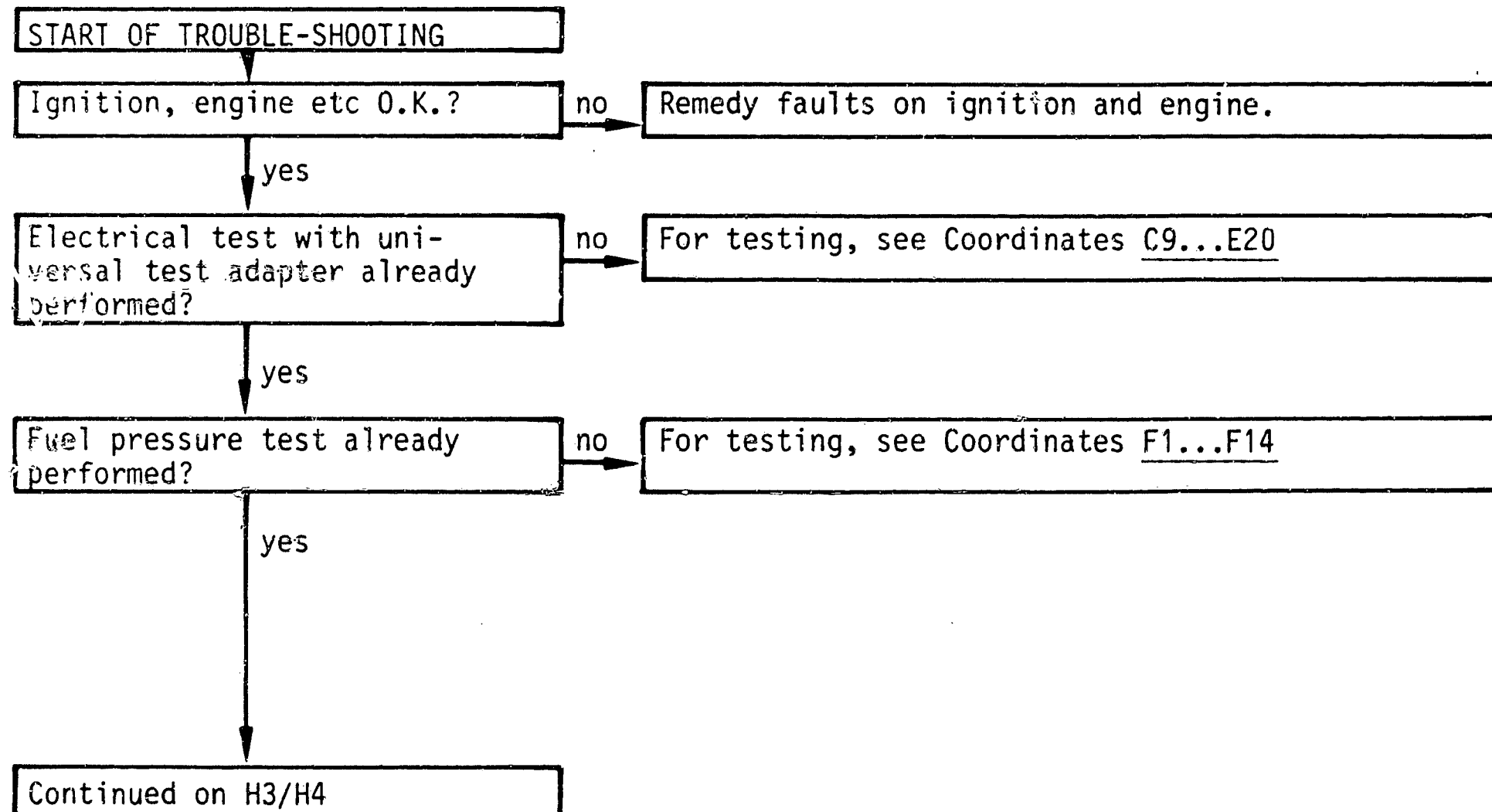
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row contains the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After the test has been completed, continue trouble-shooting at the point at which you branched off.



H1

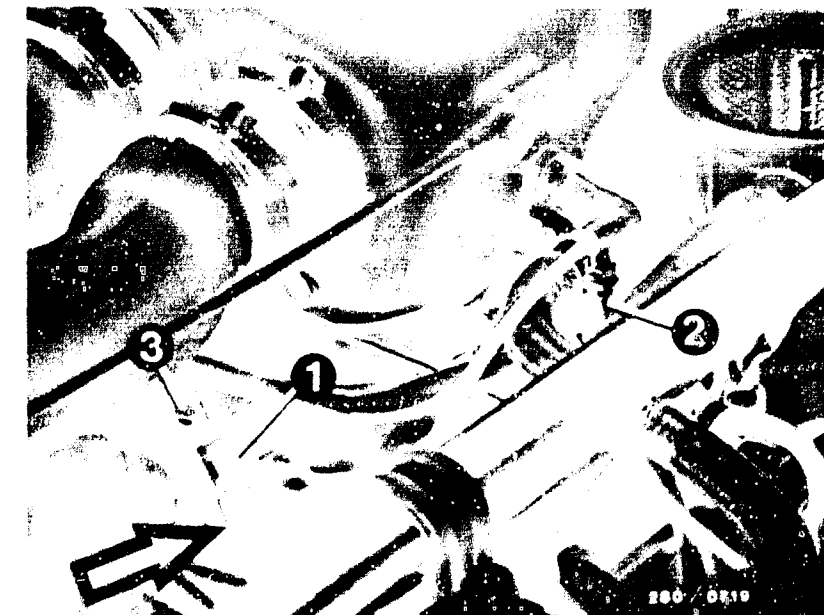
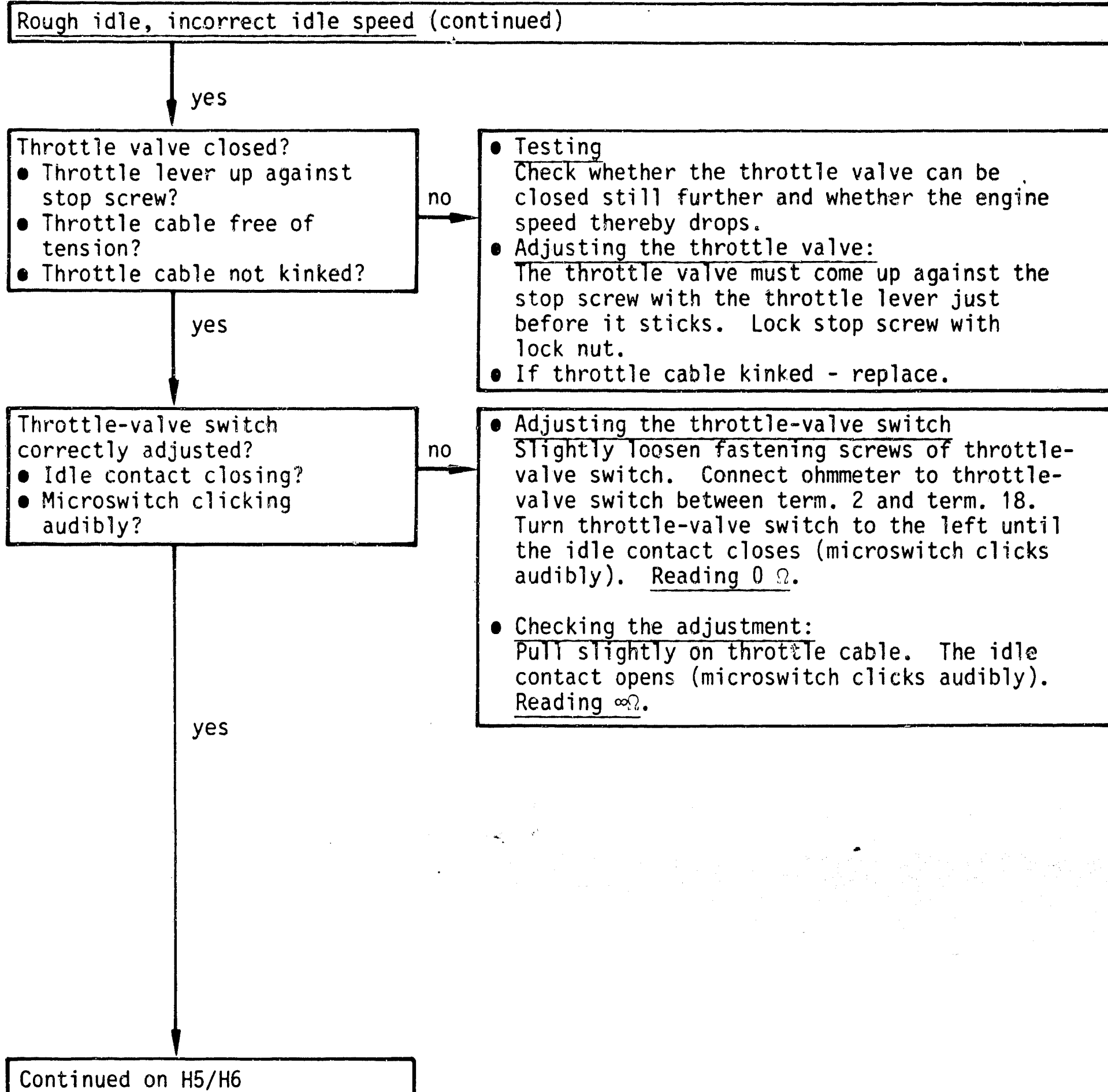
Rough idle
Porsche 928 S



H2

Rough idle
Porsche 928 S





1 = Throttle-valve switch
2 = Throttle-valve stop screw
3 = Fastening screw
Arrow = Press retainer to disconnect plug.

H3

Rough idle
Porsche 928 S



H4

Rough idle
Porsche 928 S



Rough idle, incorrect idle speed (continued)

yes

Idle speed:
700...750 min⁻¹
CO concentration
(with engine at normal
operating temperature).
0.5...1.5 vol. % CO
(Australia, Sweden,
Switzerland version
0.5...1.0 vol. % CO)
(CO adjustment with second-
ary-air injection dis-
connected).

Idle speed and CO concen-
tration correctly ad-
justed?

no

Idle speed and CO adjustment

● Idle speed (adjusting)

Requirement: The adjusting operations must
be performed as quickly as possible so that
the intake passages do not heat up, thereby
falsifying the CO reading.

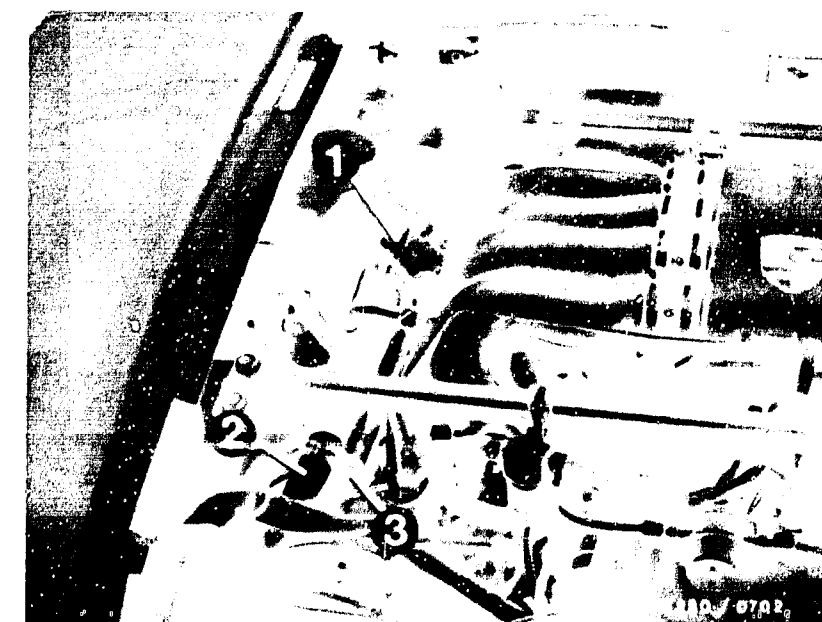
- Take off right-hand air intake hose.
- Pull off hose to air pump.
- Seal off pipe to blow-off change-over
valve (e.g. rubber sleeve from the door
Porsche Part No. 999.703.163.40).
- Re-mount right-hand air intake hose.
- Bring engine to normal operating temperature.
- Connect motortester and exhaust-gas analyzer.
- Turn idle-air screw on throttle-valve
assembly until checking and setting value:
700...750 min⁻¹
is obtained.

Caution: Idle speed must not drop below
700 min⁻¹ since otherwise the ignition timing
is changed.

yes

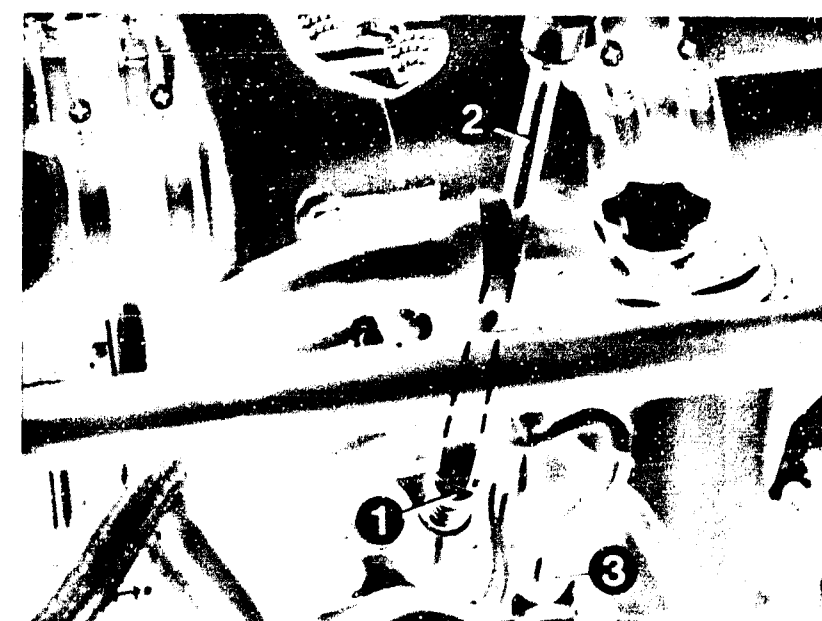
Continued on H9/H10

Continued on H7/H8



- 1 = Blow-off change-over valve
2 = Hose to air pump
3 = Rubber sleeve

- 1 = Idle air screw for engine-speed
adjustment
2 = Screwdriver
3 = Temperature sensor (double NTC)



H5

Rough idle
Porsche 928 S



H6

Rough idle
Porsche 928 S



Rough idle, incorrect idle speed (continued)

- CO concentration

Adjusting:

Introduce special Porsche tool 9187 into the hexagon-socket-head cap screw A/F 3 of the air-mass sensor and turn the potentiometer appropriately for the idle mixture adjustment.

- Switch off exhaust extractor while measuring. Observe safety regulations.

Checking and setting value:

0.5...1.5 vol. % CO

(Australia, Sweden, Switzerland version:

0.5...1.0 vol. % CO)

The Porsche 928 S is equipped as of 8.83 with secondary-air injection. Therefore, the above-explained procedure must be adopted for adjusting the idle speed and the CO concentration.

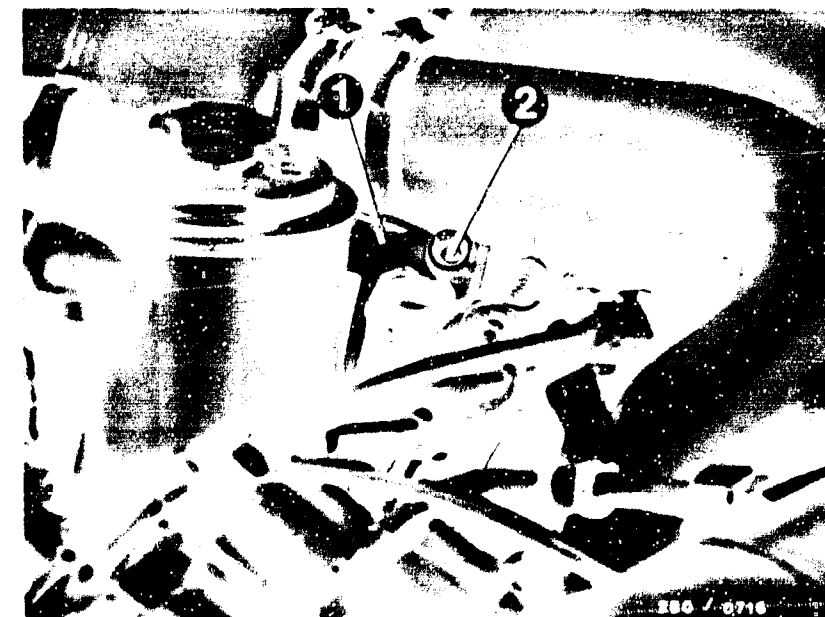
For all vehicles:

If CO concentration too high, turn CO adjusting screw in hot-wire air-mass sensor half a turn in a counterclockwise direction (hexagon-socket-head cap screw A/F 3 mm). Check idle speed and CO concentration again. If necessary, make corrections in several steps. After adjusting, use new, red plug (1 280 508 012).

Caution: Remove plug from air line and connect hose. Re-connect air intake hose if previously disconnected.

yes

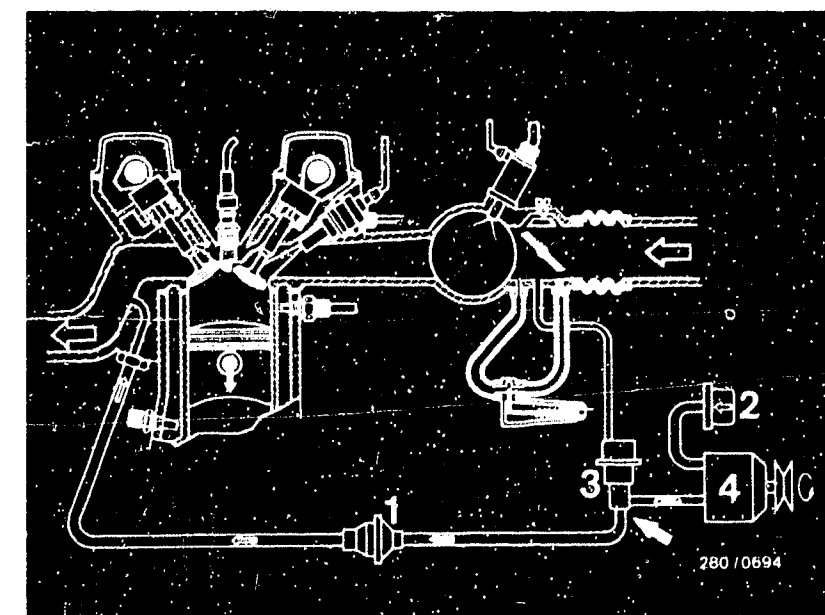
Continued on H9/H10



1 = Hot-wire air-mass sensor
2 = Mixture-adjusting screw

1 = Non-return valve
2 = Air filter for air pump
3 = Blow-off change-over valve
4 = Air pump
Arrow = Seal outlet.

On the 928 S, seal air line from air pump to blow-off change-over valve.



H7

Rough idle

Porsche 928 S



H8

Rough idle

Porsche 928 S



Rough idle, incorrect idle speed (continued)

yes

Auxiliary-air device mechanically O.K.?
Free cross section:
• cold - open?
• warm - closed?
• Does engine speed drop when hose is pinched off? (Engine cold).

no

Testing:

- Visual examination of auxiliary-air device:
Disconnect hoses and look down (possibly using a small mirror). When cold, the cross section must be partially open; when the engine is warm, it must be closed. If not, replace auxiliary-air device (arrow).
- Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. There must be no noticeable drop in engine speed. If incorrect, replace auxiliary-air device (pay attention to the direction of flow).

yes

Electrical operation of auxiliary-air device (power supply, ground lead, resistance) O.K.?

no

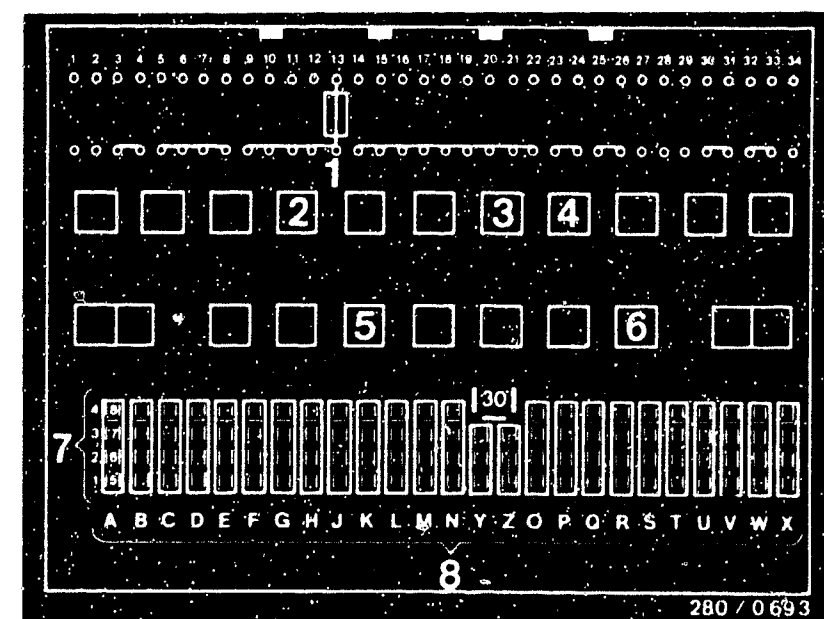
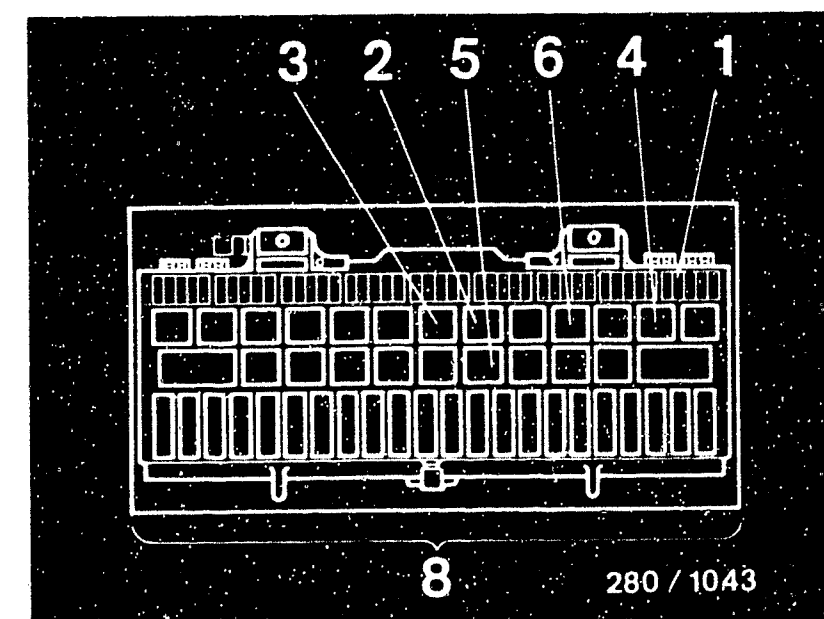
Start engine. (Values in parentheses apply to central-electrics box as of 10.84 - center picture).

- Voltage at plug min. 12 V. If not, check the following leads for continuity (set value approx. 0 Ω):
- From auxiliary-air device connection to engine-compartment plug no. 7 (in engine compartment, center right, above ignition coil). From engine-compartment plug no. 7 to central-electrics box plug Q No. 1 (Q No. 14). From Q No. 1 to central-electrics box plug T No. 5. From T No. 5 (Q No. 14) to pump fuse (Item 1) No. 13 (No. 42) (positive supply).
- Ground connection (right-hand toothed-belt cover on camshaft housing).

yes

Continued on H13/H14

Continued on H11/H12



H9

Rough idle
Porsche 928 S



H10

Rough idle
Porsche 928 S



Rough idle, incorrect idle speed (continued)

- Resistance at auxiliary-air device
10...45 Ω :
If resistance not within tolerance, replace
auxiliary-air device. (Check idle speed).

yes

Continued on H13/H14

H11

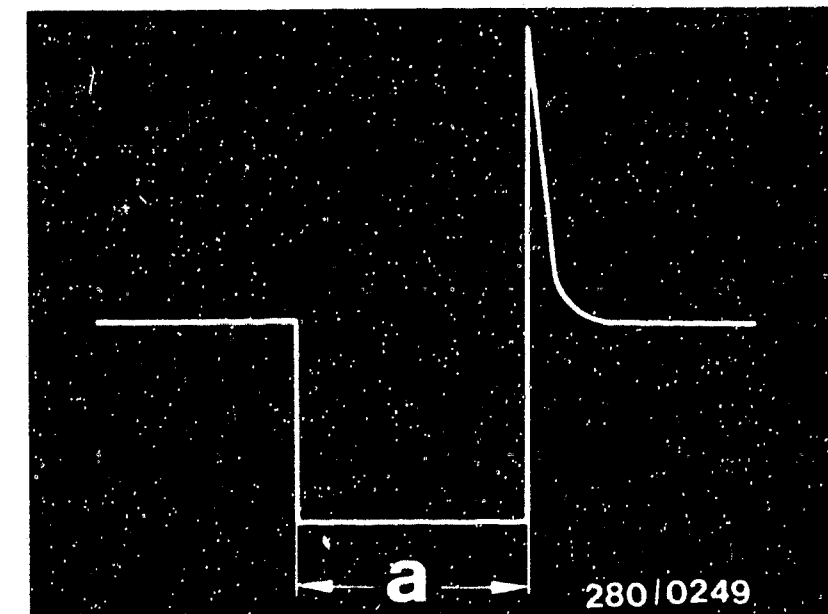
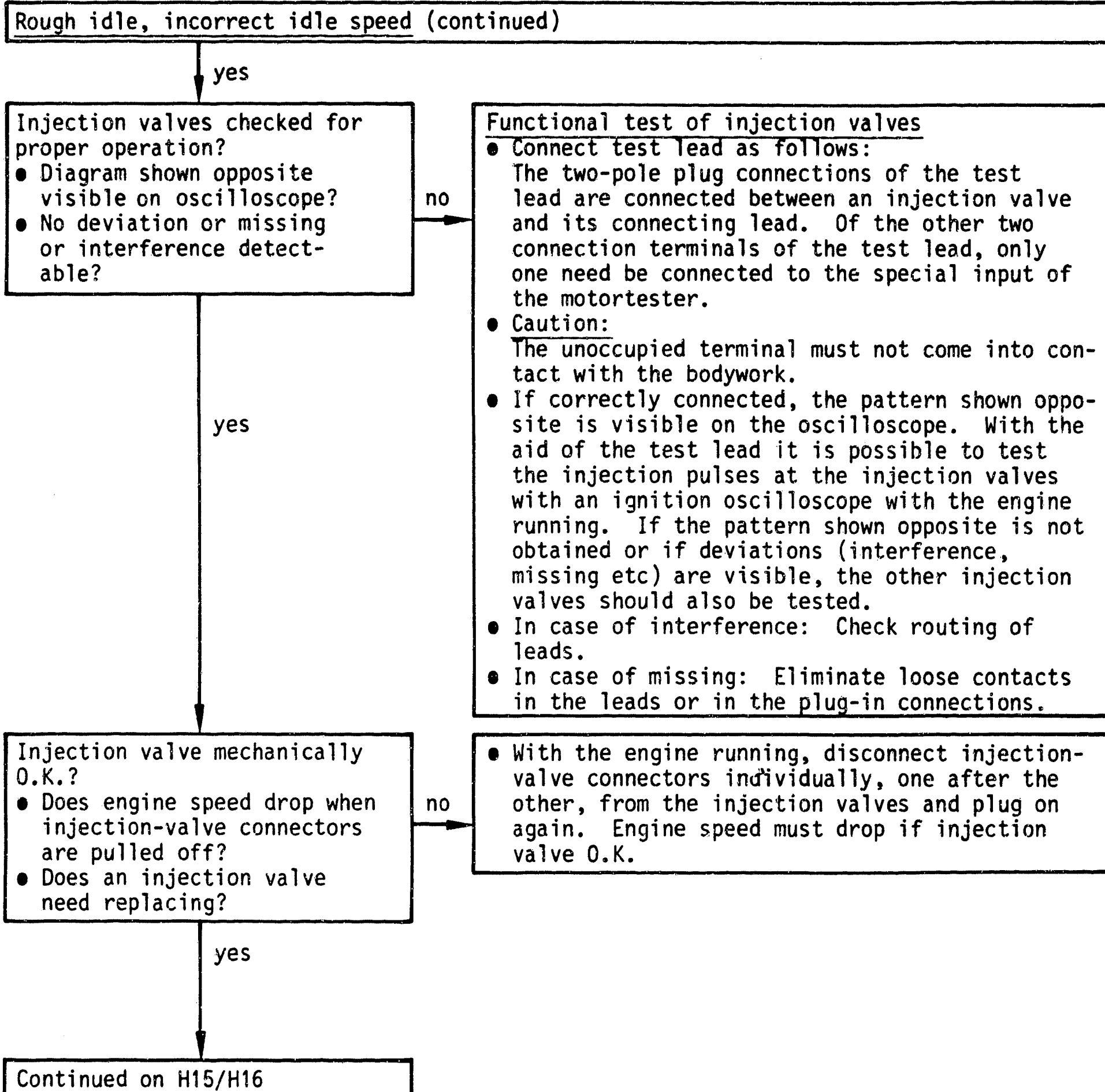
Rough idle
Porsche 928 S



H12

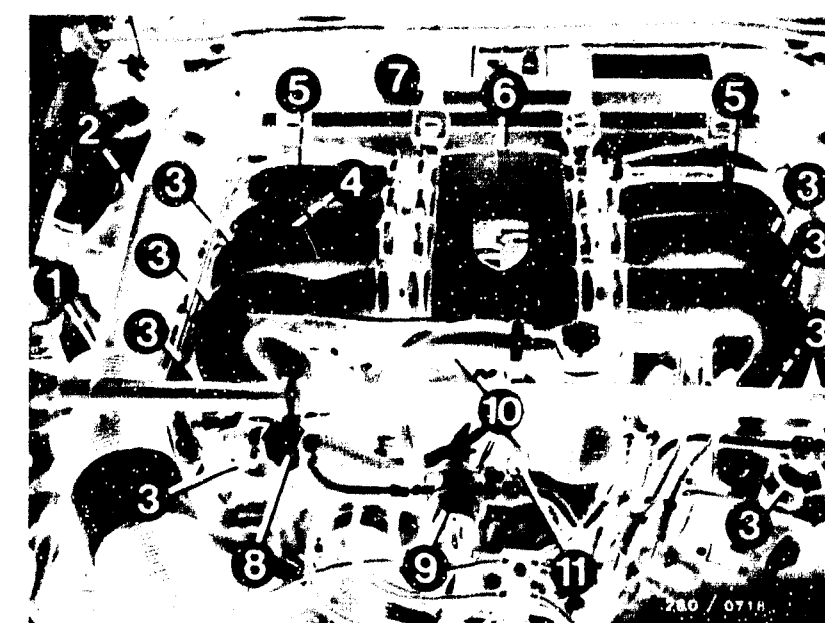
Rough idle
Porsche 928 S





Injection pulses of a switched output stage (measured at the injection valve)
a = Pulse length (dependent on engine load).

3 = Injection valves



H13

Rough idle
Porsche 928 S



H14

Rough idle
Porsche 928 S



Rough idle; incorrect idle speed (continued)

yes

Injection valves O.K.?

• Removal and installation

no

yes

• Removal

Remove fuel-distribution pipes with injection valves.

- Remove air-intake hoses, air filter with top and bottom parts (with hot-wire air-mass sensor).
 - Loosen fastening screws on fuel-distribution pipe and on injection valves.
 - Loosen strut.
 - Loosen intake manifold connection.
 - Pull all 8/4 injection valves simultaneously and carefully out of the cylinder.
- If injection valves defective on one side, loosen fuel-distribution pipe at pressure regulator.

Caution: Make sure that no fuel gets onto hot parts of the engine.

- Pull off electrical connection.
- Break open hose-termination sleeve on fuel-distribution pipe.
- Cut open hose in longitudinal direction with soldering iron and remove injection valve.

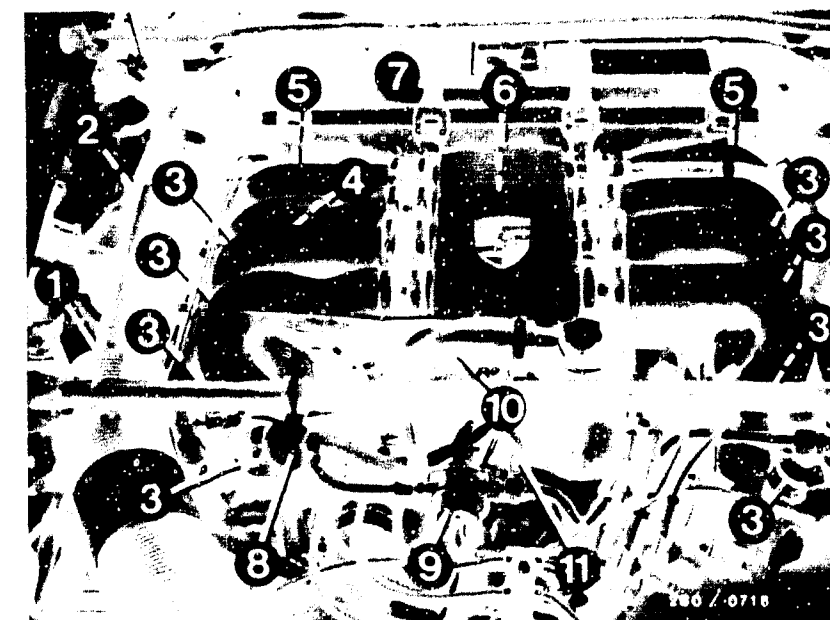
Caution: Do not allow escaping fuel to drip onto hot parts of the engine.

Warning: Before installing, the rubber seals at the valve mouth sleeve may be greased only lightly (silicone grease Ft 2 v 1). The other parts must remain grease-free.

• Installation

- Plug on hose-termination sleeve (fuel-distribution pipe).
- Plug on new injection valve (make sure there are no leaks).

Install the further components so that the original condition is re-established.



3 = Injection valves

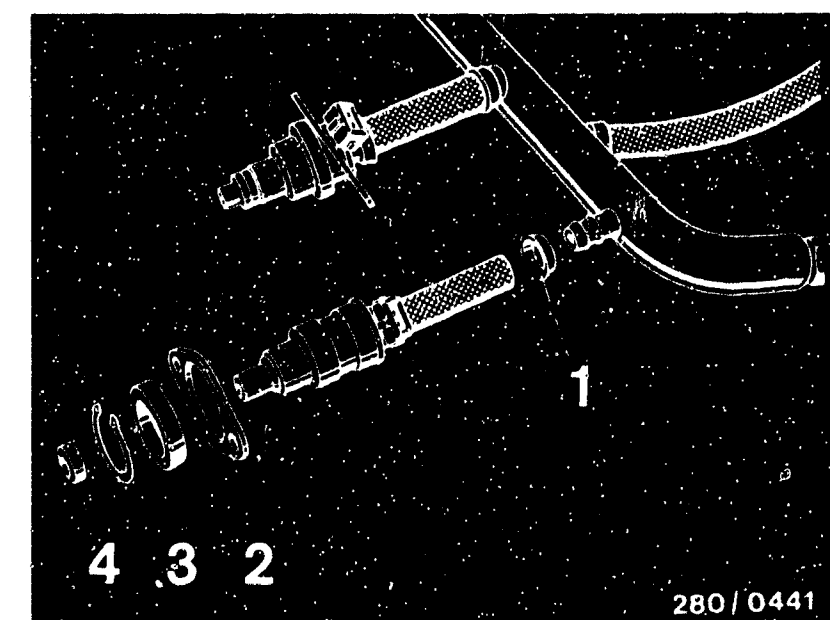
Similar to Porsche 928 S

1 = Hose-termination sleeve

2 = Holder

3 = Rubber seal

4 = Retainer



Continued on H17/H18

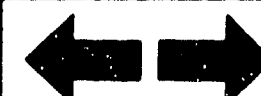
H15

Rough idle
Porsche 928 S



H16

Rough idle
Porsche 928 S



280 / 0441

Rough idle, incorrect idle speed (continued)

yes

Solenoid-operated air valve
for air conditioner O.K.?

no

Operation

The solenoid-operated air valve opens after the air conditioner has been switched on. The idle speed remains unchanged.

● Testing

- Ignition "ON". Engine stopped. Switch on air conditioner.
- Measure voltage at solenoid-operated air valve (set value 8...15 V)

If no voltage: Check connecting leads, magnetic clutch (compressor), low-pressure switch, thermo-switch (icing protection) and control switch (instrument panel):

If voltage present:

- Start engine and run.
- Engine speed too low with air conditioner on?
(Idle correctly adjusted)
- Replace solenoid-operated air valve.
- Engine speed too high with air conditioner off?
(Idle correctly adjusted)
- Pinch off hose before solenoid-operated air valve.

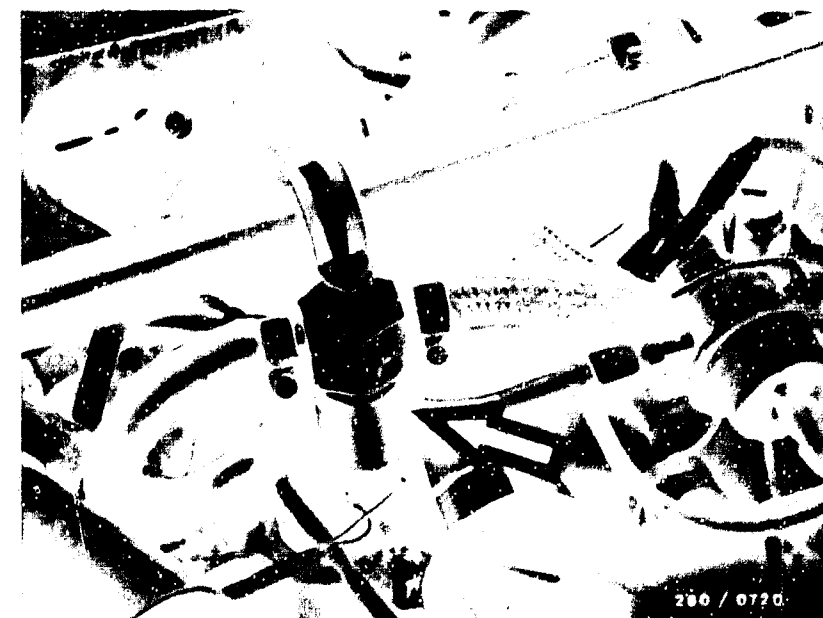
If engine speed O.K. - replace solenoid-operated air valve.

There must be no voltage across the solenoid-operated air valve.

- Air-adjusting screw correctly adjusted?
Requirement; Idle and CO correctly adjusted.
Adjusting: Insert the air-adjusting screw so that the idle speed remains constant when the air conditioner is switched on.

yes

Continued on H19/H20



Arrow = Solenoid-operated air valve

H17

Rough idle
Porsche 928 S



H18

Rough idle
Porsche 928 S



Rough idle, incorrect idle speed (continued)

yes

All hose lines correctly connected, not kinked or damaged?

Visual examination:

- Air-intake system checked for leaks with 0.3 bar gauge pressure?

no

- Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.

Leak test

• Preparations

- Remove left-hand and right-hand air intake hoses.
- Loosen rubber bands on air filter and lift off top part of air filter.
- Loosen hose from blow-off change-over valve to right-hand part of lower half of air filter housing.
- Loosen 2 hexagon screws A/F13 in bottom part of air-filter housing.
- Remove bottom part of housing with hot-wire air-mass sensor.

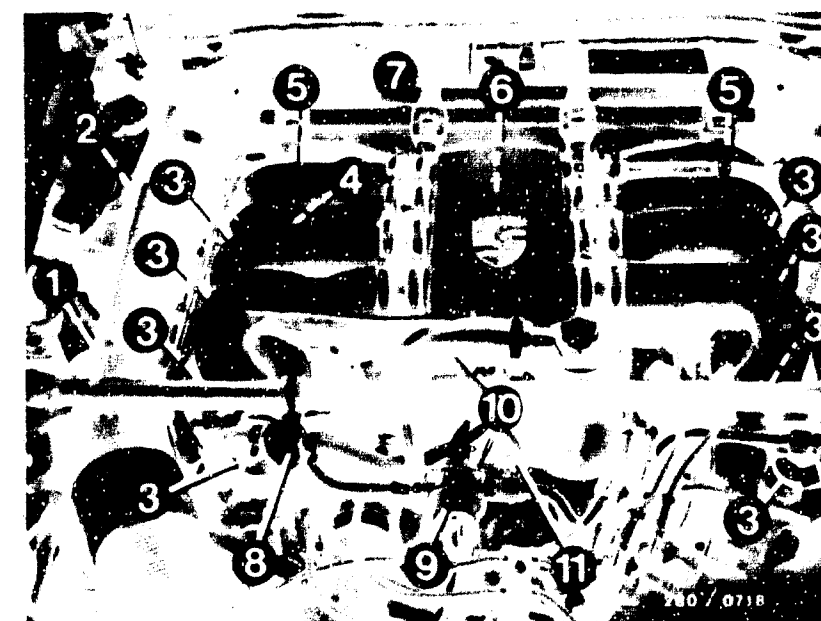
Warning: Withdraw bottom part of air filter housing and hot-wire air-mass sensor slowly from the intake manifold fitting. Do not lose O-ring in fitting and O-ring (dust protection on hot-wire air-mass sensor).

- Loosen hot-wire air-mass sensor from bottom part of air filter housing and seal the air inlet opening e.g. with dust-protection cover of pack).
- Re-mount bottom part of air filter housing on hot-wire air-mass sensor.
- Disconnect both hoses from auxiliary-air device and seal off tight the hose to the intake manifold.
- Mount bottom part of air filter housing with the 2 hexagon screws A/F 13.

yes

Continued on H23/H24

Continued on H21/H22



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

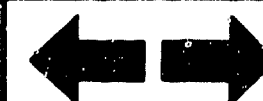
H19

Rough idle
Porsche 928 S



H20

Rough idle
Porsche 928 S

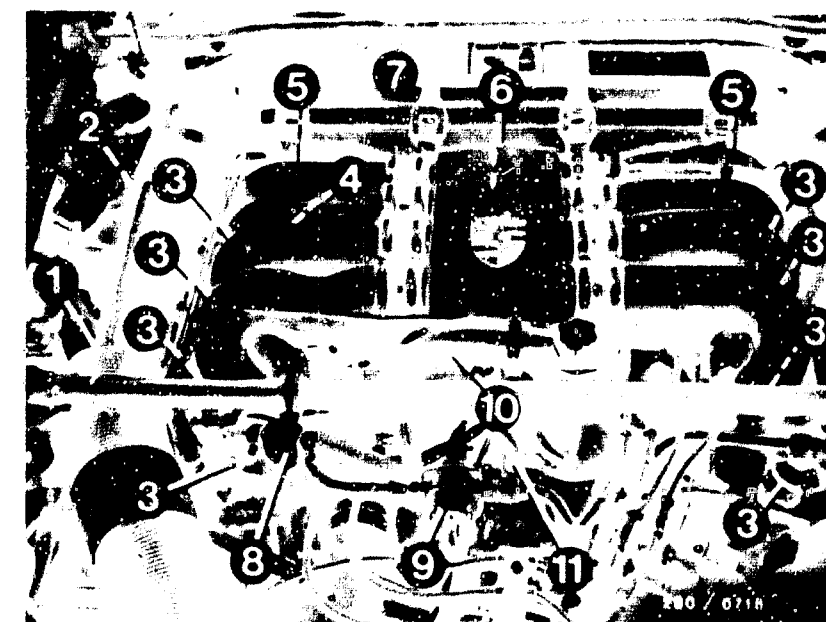


Rough idle, incorrect idle speed (continued)

yes

- Testing
 - Blow air (0.3 bar gauge pressure) into the intake manifold with compressed-air gun.
 - Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Leaks may also occur at the following points on the engine:
 - Oil dipstick not securely inserted.
 - Defective cap seal on oil filler neck.
 - O-ring in intake manifold fitting leaking etc.
 - Bubbling or foaming indicates a leak.
- Installation

Install in the reverse sequence to removal. Lightly grease O-ring in intake manifold fitting (acid-free grease). Remove dust-protection cover. Re-establish the original condition.



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

Continued on H23/H24

H21

Rough idle
Porsche 928 S



H22

Rough idle
Porsche 928 S



Rough idle, incorrect idle speed (continued)

yes

Idle speed:
700...750 min⁻¹
CO concentration
(with engine at normal
operating temperature):
0.5...1.5 vol. % CO
(Australia, Swede,
Switzerland version
0.5...1.0 vol. % CO)
(CO adjustment with second-
ary-air injection dis-
connected).
Idle speed and CO concen-
tration correctly ad-
justed?
(Repeat)

yes

Continued on J3/J4

no

Idle speed and CO adjustment

• Idle speed (adjusting)

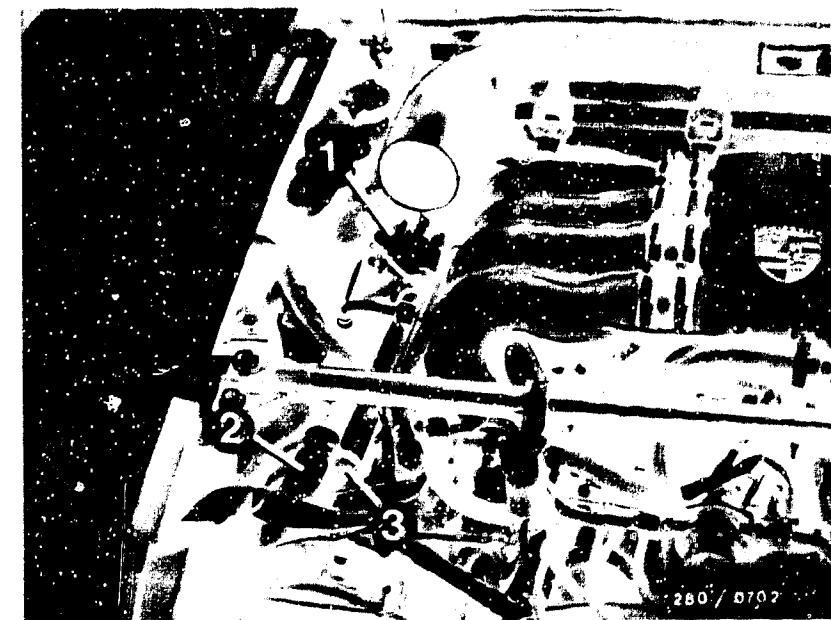
Requirement: The adjusting operations must be performed as quickly as possible so that the intake passages do not heat up, thereby falsifying the CO reading.

- Take off right-hand air intake hose.
- Pull off hose to air pump.
- Seal off pipe to blow-off change-over valve (e.g. rubber sleeve from the door Porsche Part No. 999. 703. 163. 40).
- Re-mount right-hand air intake hose.
- Bring engine to normal operating temperature.
- Connect motortester and exhaust-gas analyzer.
- Turn idle-air screw on throttle-valve assembly until checking and setting value:
700...750 min⁻¹

is obtained.

Caution: Idle speed must not drop below 700 min⁻¹ since otherwise the ignition timing is changed.

Continued on J1/J2



- 1 = Blow-off change-over valve
2 = Hose to air pump
3 = Rubber sleeve

- 1 = Idle air screw for engine-speed adjustment
2 = Screwdriver
3 = Temperature sensor (double NTC)



H23

Rough idle
Porsche 928 S



H24

Rough idle
Porsche 928 S



Rough idle, incorrect idle speed (continued)

• CO concentration

Adjusting:

Introduce special Porsche tool 9187 into the hexagon-socket-head cap screw A/F 3 of the air-mass sensor and turn the potentiometer appropriately for the idle mixture adjustment.

- Switch off exhaust extractor while measuring. Observe safety regulations.

Checking and setting value:

0.5...1.5 vol. % CO

(Australia, Sweden, Switzerland version:

0.5...1.0 vol. % CO)

The Porsche 928 S is equipped as of 8.83 with secondary-air injection. Therefore, the above-explained procedure must be adopted for adjusting the idle speed and the CO concentration.

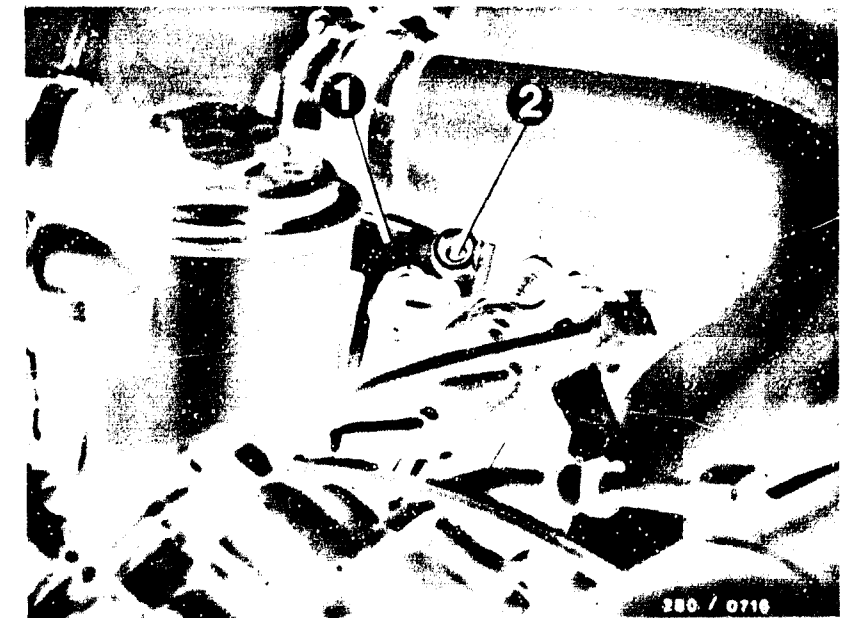
For all vehicles:

If CO concentration too high, turn CO adjusting screw in hot-wire air-mass sensor half a turn in a counterclockwise direction (hexagon-socket-head cap screw A/F 3 mm). Check idle speed and CO concentration again. If necessary, make corrections in several steps. After adjusting, use new, red plug (1 280 508 012).

Caution: Remove plug from air line and connect hose. Re-connect air intake hose if previously disconnected.

yes

Continued on J3/J4

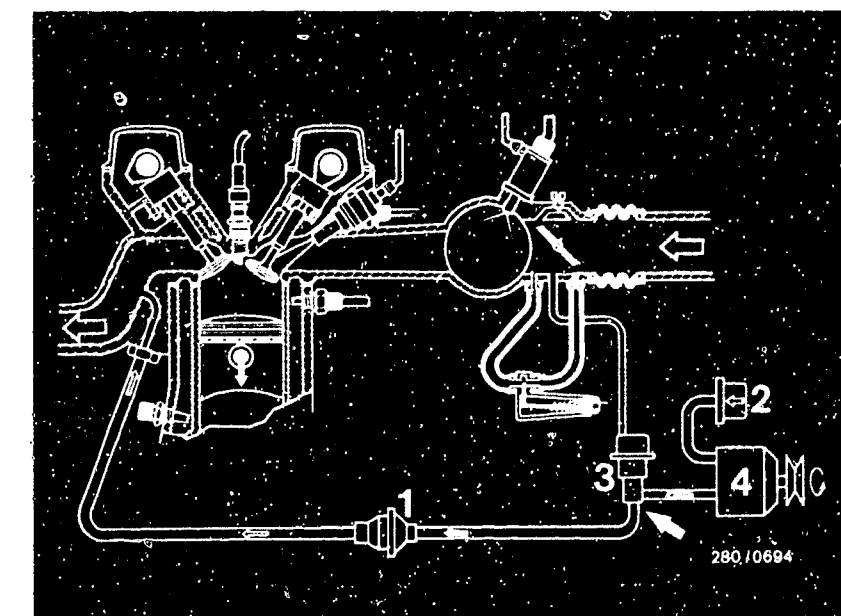


- 1 = Hot-wire air-mass sensor
- 2 = Mixture-adjusting screw

- 1 = Non-return valve
- 2 = Air filter for air pump
- 3 = Blow-off change-over valve
- 4 = Air pump

Arrow = Seal outlet.

On the 928 S, seal air line from air pump to blow-off change-over valve



J1

Rough idle

Porsche 928 S



J2

Rough idle

Porsche 928 S



Rough idle, incorrect idle speed (continued)

yes

Trouble-shooting program
completed for customer
complaint

"Rough idle, incorrect
idle speed".

Fault eliminated?

no

Further possibilities:

- Customer complaint incorrectly diagnosed
(see Coordinates C3...C8).
If the fault has not been detected with the
"direct trouble-shooting chart", see
"detailed trouble-shooting chart"
(Coordinates C3...C4).
- Engine not mechanically O.K. (Compres-
sion, valve setting, valve timing, worn
camshaft).

J3

Rough idle
Porsche 928 S



J4

Rough idle
Porsche 928 S



POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaint

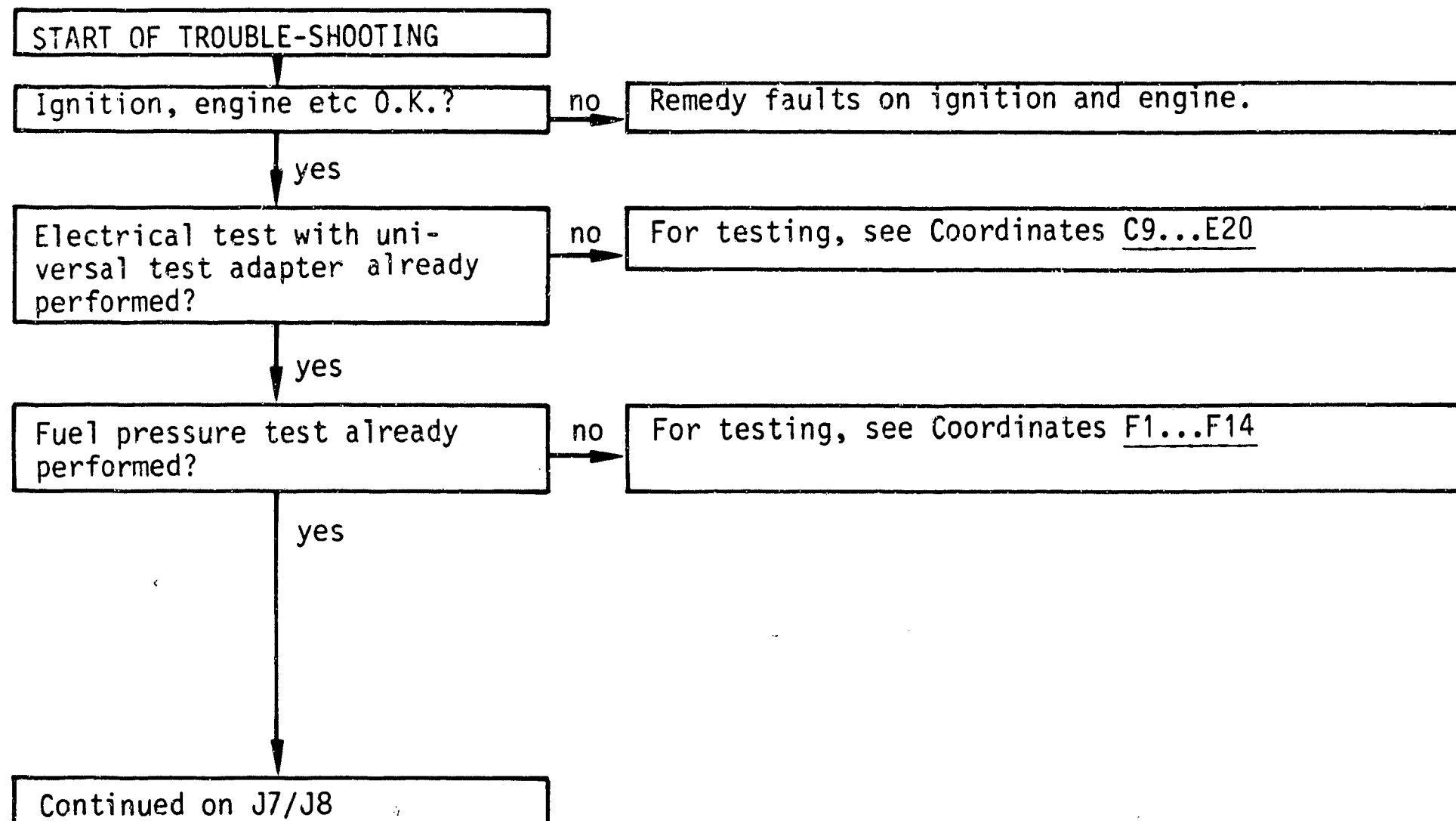
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row contains the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After the test has been completed, continue trouble-shooting at the point at which you branched off.



J5

Poor throttle take-up
Porsche 928 S



J6

Poor throttle take-up
Porsche 928 S



Poor throttle take-up (continued)

yes

Throttle valve closed?

- Throttle lever up against stop screw?
- Throttle cable free of tension?
- Throttle cable not kinked?

no

• Testing

Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.

• Adjusting the throttle valve:

The throttle valve must come up against the stop screw with the throttle lever just before it sticks. Lock stop screw with lock nut.

- If throttle cable kinked - replace.

yes

Throttle-valve switch correctly adjusted?

- Idle contact closing?
- Microswitch clicking audibly?

no

• Adjusting the throttle-valve switch

Slightly loosen fastening screws of throttle-valve switch. Connect ohmmeter to throttle-valve switch between term. 2 and term. 18. Turn throttle-valve switch to the left until the idle contact closes (microswitch clicks audibly). Reading 0Ω .

• Checking the adjustment:

Pull slightly on throttle cable. The idle contact opens (microswitch clicks audibly). Reading $\infty \Omega$.

yes

Continued on J9/J10



1 = Throttle-valve switch

2 = Throttle-valve stop screw

3 = Fastening screw

Arrow = Press retainer to disconnect plug.

J7

Poor throttle take-up

Porsche 928 S



J8

Poor throttle take-up

Porsche 928 S



Poor throttle take-up (continued)

yes

Auxiliary-air device mechanically O.K.?
Free cross section:
• cold - open?
• warm - closed?
• Does engine speed drop when hose is pinched off? (Engine cold).

no

Testing:

- Visual examination of auxiliary-air device
Disconnect hoses and look down (possibly using a small mirror). When cold, the cross section must be partially open; when the engine is warm, it must be closed. If not, replace auxiliary-air device (arrow).
- Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. There must be no noticeable drop in engine speed. If incorrect, replace auxiliary-air device (pay attention to the direction of flow).

yes

Electrical operation of auxiliary-air device (power supply, ground lead, resistance) O.K.?

no

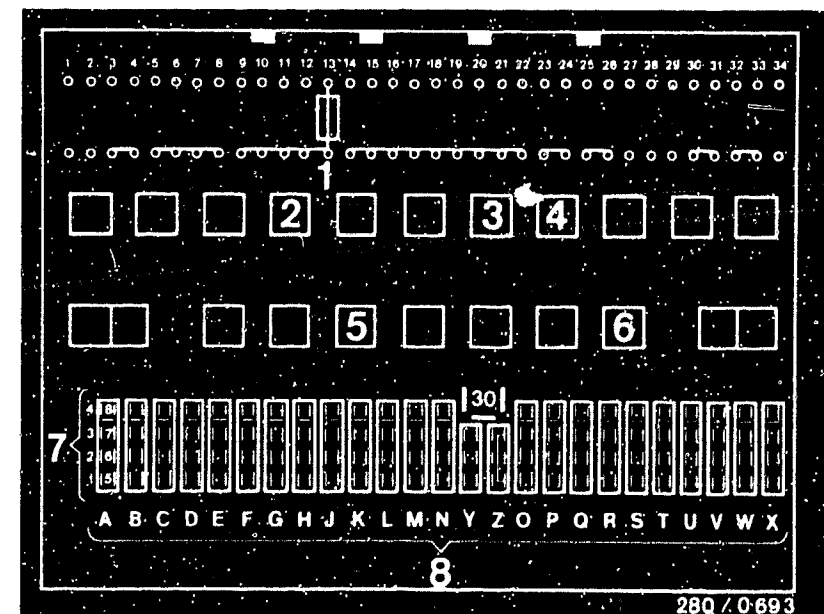
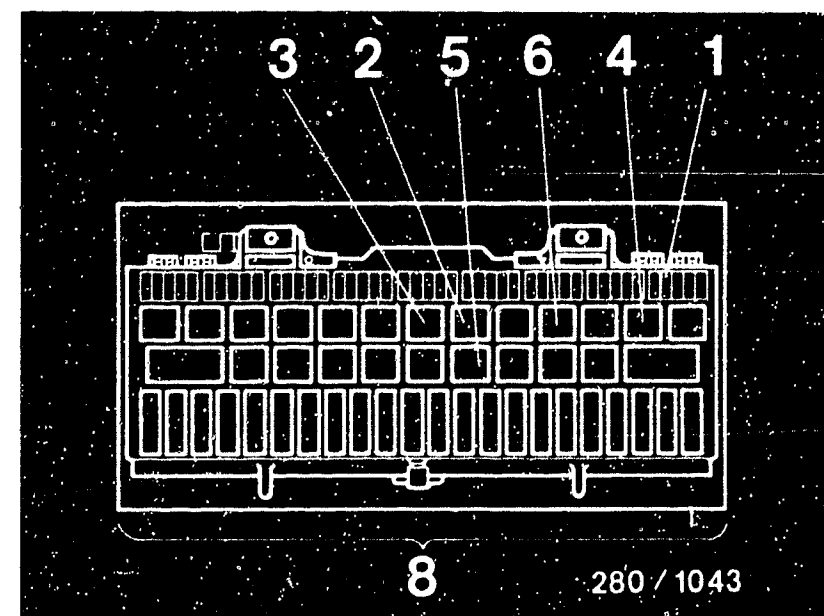
Start engine. (Values in parentheses apply to central-electrics box as of 10.84 - center picture).

- Voltage at plug min. 12 V. If not, check the following leads for continuity (set value approx. 0 Ω):
- From auxiliary-air device connection to engine-compartment plug no. 7 (in engine compartment, center right, above ignition coil). From engine-compartment plug no. 7 to central-electrics box plug Q No. 1 (Q No. 14). From Q No. 1 to central-electrics box plug T No. 5. From T No. 5 (Q No. 14) to pump fuse (Item 1) No. 13 (No. 42) (positive supply).
- Ground connection (right-hand toothed-belt cover on camshaft housing).

yes

Continued on J11/J12

Continued on J11/J12



J9

Poor throttle take-up
Porsche 928 S



J10

Poor throttle take-up
Porsche 928 S



Poor throttle take-up (continued)

yes

- Resistance at auxiliary-air device
10...45 Ω :
If the resistance is not within tolerance, re-
place auxiliary-air device. (Check idle speed).

Hot-wire air-mass sensor
mechanically and elec-
trically O.K.?

- Hot wire not broken?
- Resistance values within
tolerance?
Between term. 6 and term. 3:
0...1100 Ω
Between term. 5 and term. 3:
3.6...4.1 Ω

no

Removal

- Remove left-hand and right-hand air intake
hoses.
- Loosen rubber bands on air filter and lift
off top part
- Loosen hose from blow-off change-over valve
to right-hand part of lower half of air filter
housing.
- Loosen 2 hexagon screws A/F 13 in bottom part
of air filter housing.
- Remove bottom part of housing with hot-wire
air-mass sensor.

Warning: Withdraw bottom part of air filter
housing and hot-wire air-mass sensor slowly
from the intake manifold fitting. Do not
lose O-ring (in fitting) and O-ring (dust
protection).

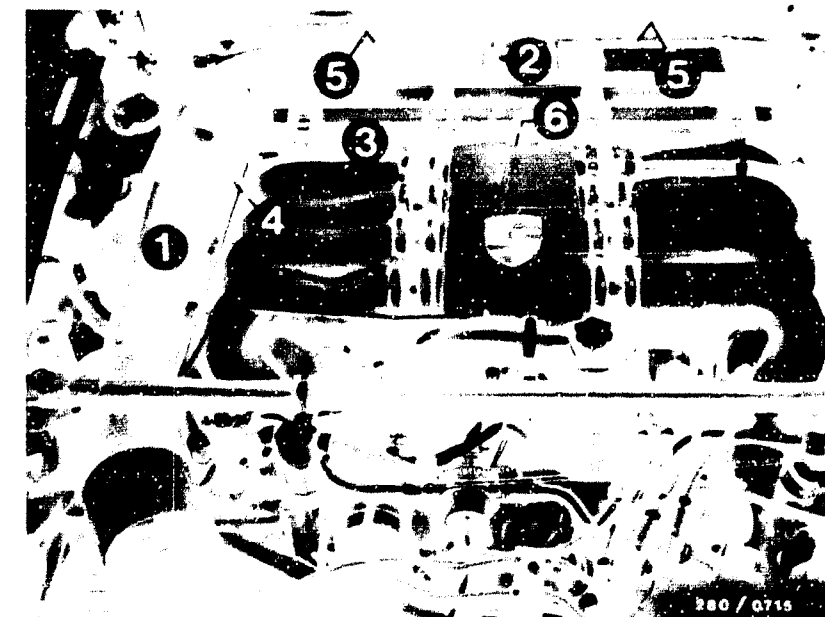
Visual examination

- Plug correctly connected.
- Spring retainer snapped in position.
- Plug not turned round.
- No pins pushed back or poor contact. Make
sure that seal is correctly seated in plug.
- Wire screen O.K. on both sides?
If hot wire broken - replace hot-wire air-
mass sensor.

yes

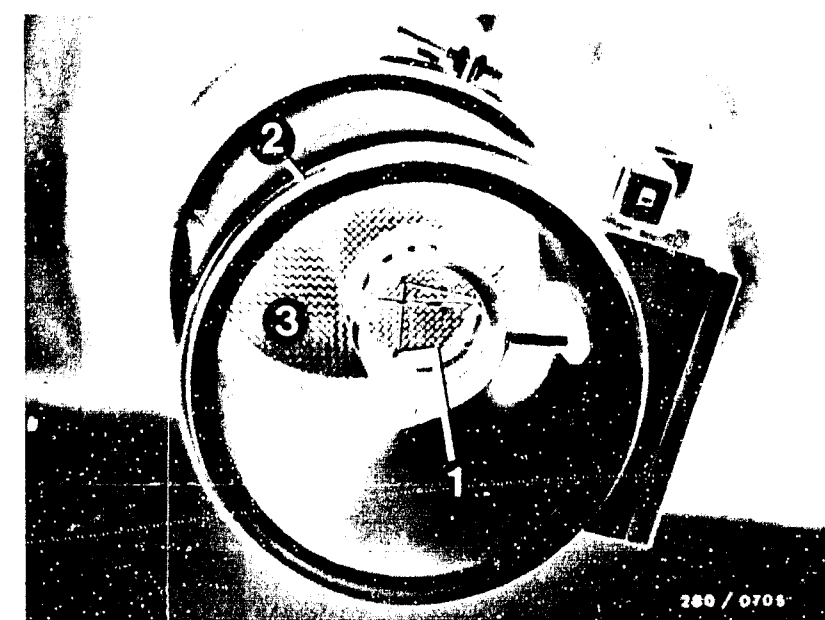
Continued on J15/J16

Continued on J13/J14



- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over
valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor

- 1 = Hot wire
- 2 = O-ring (dust protection)
- 3 = Wire screen



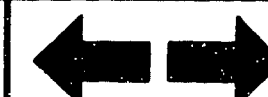
J11

Poor throttle take-up
Porsche 928 S



J12

Poor throttle take-up
Porsche 928 S



Poor throttle take-up (continued)

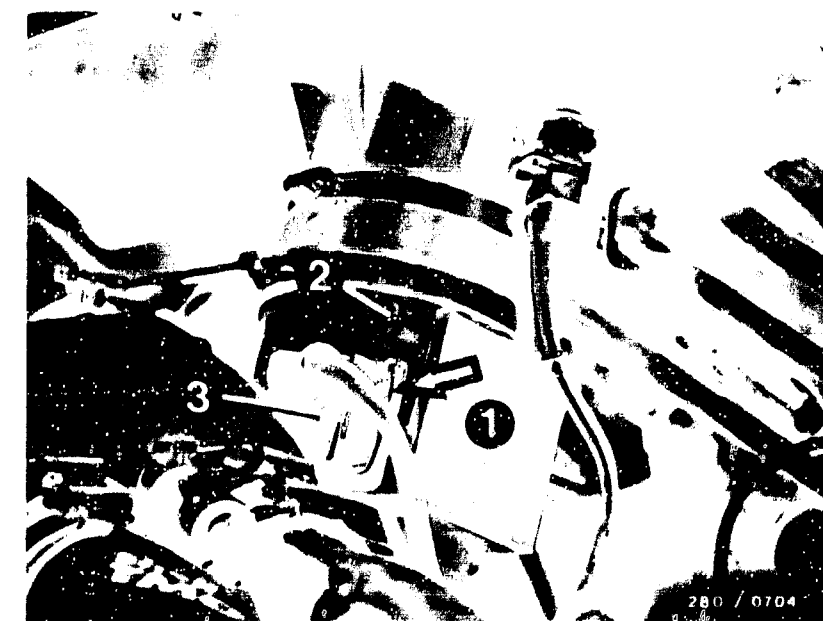
yes

● Electrical test

- Disconnect plug. Set multimeter/motortester to Ω range.
Resistance measurement
between term. 6 and term. 3:
0...1100 Ω
between term. 5 and term. 3:
3.6...4.1 Ω
If incorrect, replace hot-wire air-mass sensor.

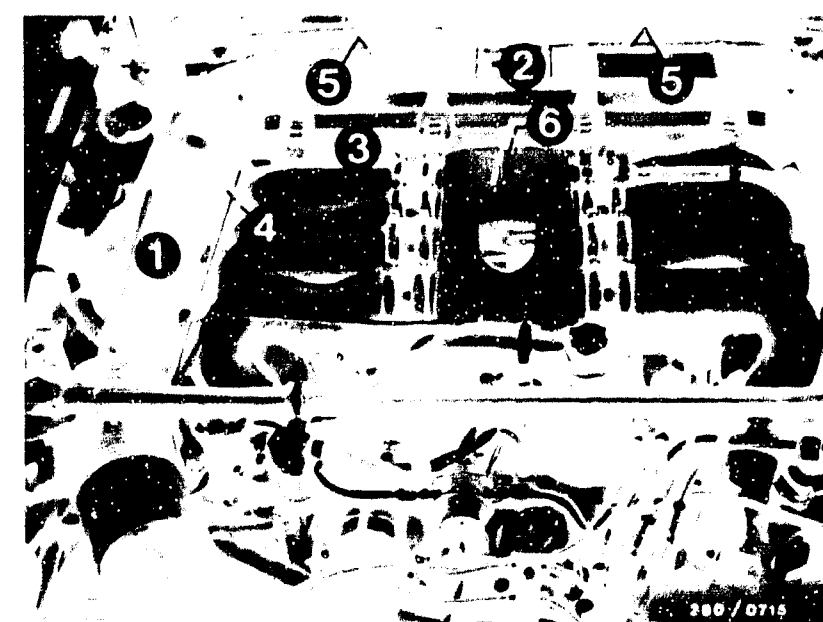
Installation

- Connect plug to hot-wire air-mass sensor (right way round).
- Lightly grease O-ring in fitting (use acid-free grease).
Ensure correct position of O-ring.
- Provide idle-mixture-adjusting screw with red plug 1 280 508 012.
- Carefully press bottom part of air filter housing with hot-wire air-mass sensor into intake manifold fitting. When mounting, pay attention to position and leak-tightness of O-ring and to accessibility of idle-mixture-adjusting screw when installed.
- Fasten bottom part of air filter housing with both hexagon screws (A/F 13).
- Re-fasten hose from blow-off change-over valve on bottom part of air filter housing.
- Assemble air filter and fasten with rubber bands.
- Correctly connect air intake hoses.



- 1 = Hot-wire air-mass sensor
- 3 = Plug
Press retainer in direction of arrow when disconnecting plug

- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor



Continued on J15/J16

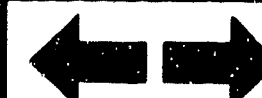
J13

Poor throttle take-up
Porsche 928 S



J14

Poor throttle take-up
Porsche 928 S



Poor throttle take-up (continued)

yes

Idle speed:
 $700 \dots 750 \text{ min}^{-1}$
CO concentration
(with engine at normal
operating temperature):
 $0.5 \dots 1.5 \text{ vol. \% CO}$
(Australia, Sweden,
Switzerland version
 $0.5 \dots 1.0 \text{ vol. \% CO}$)
(CO adjustment with second-
ary-air injection dis-
connected).
Idle speed and CO concen-
tration correctly ad-
justed?

no

Idle speed and CO adjustment

• Idle speed (adjusting)

Requirement: The adjusting operations must be performed as quickly as possible so that the intake passages do not heat up, thereby falsifying the CO reading.

- Take off right-hand air intake hose.
- Pull off hose to air pump.
- Seal off pipe to blow-off change-over valve (e.g. rubber sleeve from the door Porsche Part No. 999. 703. 163. 40).
- Re-mount right-hand air intake hose.
- Bring engine to normal operating temperature.
- Connect motortester and exhaust-gas analyzer.
- Turn idle-air screw on throttle-valve assembly until checking and setting value:
 $700 \dots 750 \text{ min}^{-1}$

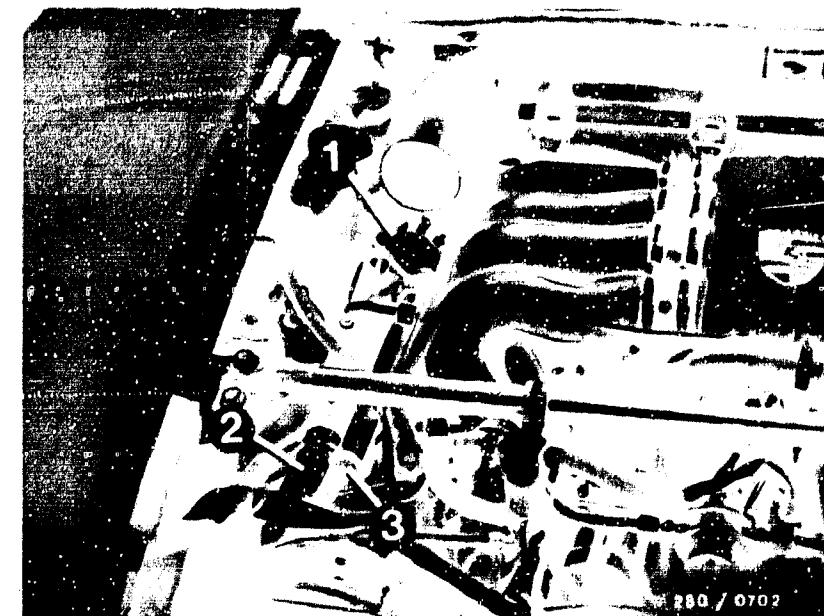
is obtained.

Caution: Idle speed must not drop below 700 min^{-1} since otherwise the ignition timing is changed.

yes

Continued on J19/J20

Continued on J17/J18



- 1 = Blow-off change-over valve
2 = Hose to air pump
3 = Rubber sleeve

- 1 = Idle air screw for engine-speed adjustment
2 = Screwdriver
3 = Temperature sensor (double NTC)



J15

Poor throttle take-up
Porsche 928 S



J16

Poor throttle take-up
Porsche 928 S



Poor throttle take-up (continued)

• CO concentration

Adjusting:

Introduce special Porsche tool 9187 into the hexagon-socket-head cap screw A/F 3 of the air-mass sensor and turn the potentiometer appropriately for the idle mixture adjustment.

- Switch off exhaust extractor while measuring. Observe safety regulations.

Checking and setting value:

0.5...1.5 vol. % CO

(Australia, Sweden, Switzerland version:

0.5...1.0 vol. % CO)

The Porsche 928 S is equipped as of 8.83 with secondary-air injection. Therefore, the above-explained procedure must be adopted for adjusting the idle speed and the CO concentration.

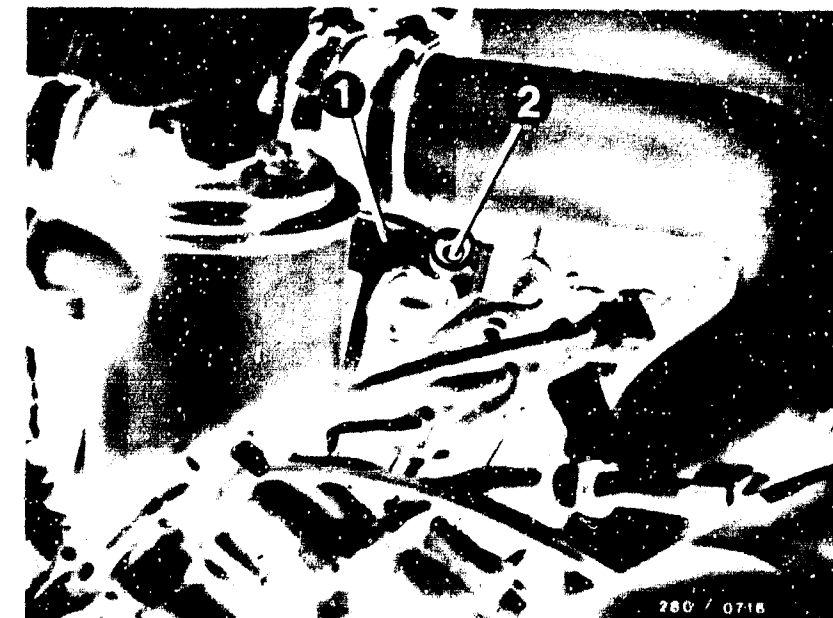
For all vehicles:

If CO concentration too high, turn CO adjusting screw in hot-wire air-mass sensor half a turn in a counterclockwise direction (hexagon-socket-head cap screw A/F 3 mm). Check idle speed and CO concentration again. If necessary, make corrections in several steps. After adjusting, use new, red plug (1 280 508 012).

Caution: Remove plug from air line and connect hose. Re-connect air intake hose if previously disconnected.

yes

Continued on J19/J20

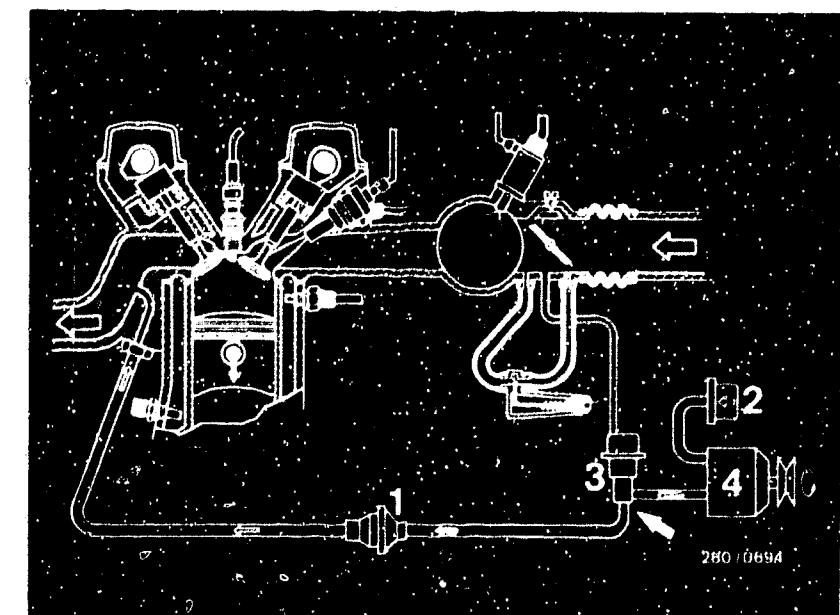


- 1 = Hot-wire air-mass sensor
- 2 = Mixture-adjusting screw

- 1 = Non-return valve
- 2 = Air filter for air pump
- 3 = Blow-off change-over valve
- 4 = Air pump

Arrow = Seal outlet

On the 928 S, seal air line from air pump to blow-off change-over valve



J17

Poor throttle take-up
Porsche 928 S



J18

Poor throttle take-up
Porsche 928 S



Poor throttle take-up (continued)

yes

All hose lines correctly connected, not kinked or damaged?

Visual examination:

- Air-intake system checked for leaks with 0.3 bar gauge pressure?

no

- Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.

Leak test

• Preparations

- Remove left-hand and right-hand air intake hoses.
- Loosen rubber bands on air filter and lift off top part of air filter.
- Loosen hose from blow-off change-over valve to right-hand part of lower half of air filter housing.
- Loosen 2 hexagon screws A/F 13 in bottom part of air-filter housing.
- Remove bottom part of housing with hot-wire air-mass sensor.

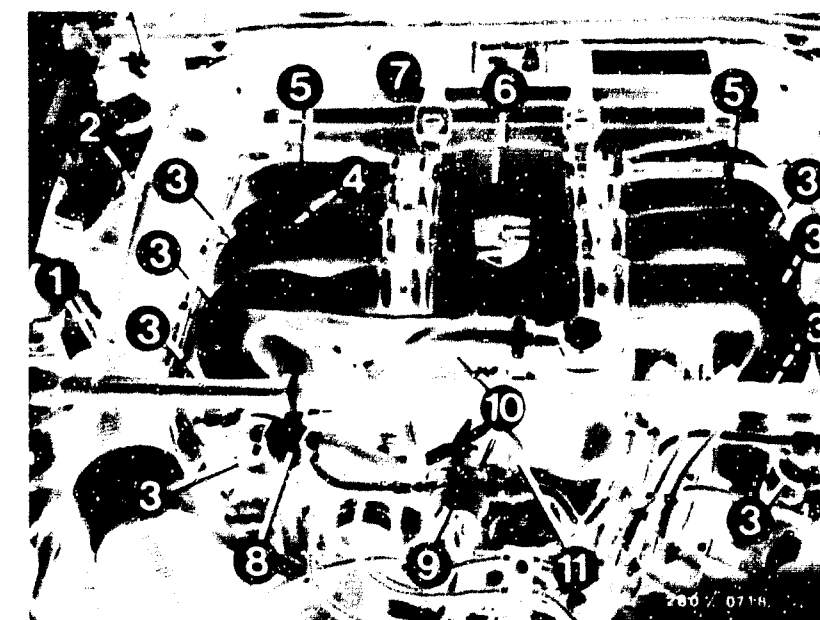
Warning: Withdraw bottom part of air filter housing and hot-wire air-mass sensor slowly from the intake manifold fitting. Do not lose O-ring in fitting and O-ring (dust protection on hot-wire air-mass sensor).

- Loosen hot-wire air-mass sensor from bottom part of air filter housing and seal the air inlet opening e.g. with dust-protection cover of pack).
- Re-mount bottom part of air filter housing on hot-wire air-mass sensor
- Disconnect both hoses from auxiliary-air device and seal off tight the hose to the intake manifold.
- Mount bottom part of air filter housing with the 2 hexagon screws A/F 13.

yes

Continued on J21/J22

Continued on J21/J22



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

J19

Poor throttle take-up
Porsche 928 S



J20

Poor throttle take-up
Porsche 928 S



Poor throttle take-up (continued)

yes

• Testing

- Blow air (0.3 bar gauge pressure) into the intake manifold with compressed-air gun.
- Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Leaks may also occur at the following points on the engine:
- Oil dipstick not securely inserted.
- Defective cap seal on oil filler neck.
- O-ring in intake manifold fitting leaking etc.
- Bubbling or foaming indicates a leak.

• Installation

Install in the reverse sequence to removal. Lightly grease O-ring in intake manifold fitting (acid-free grease). Remove dust-protection cover. Re-establish the original condition.

Trouble-shooting program completed for customer complaint

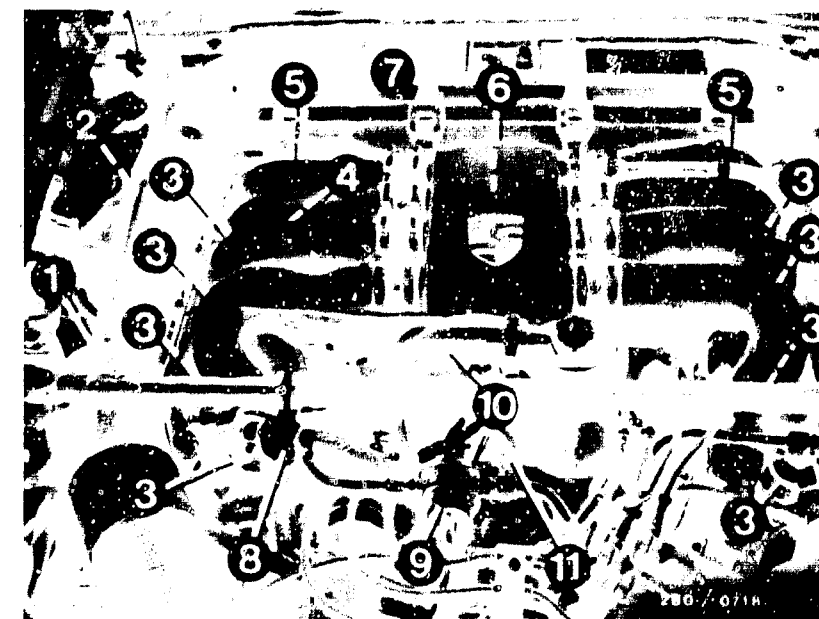
"Poor throttle take-up".

Fault eliminated?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If the fault has not been detected with the "direct trouble-shooting chart", see "detailed trouble-shooting chart" (Coordinates C3...C4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

J21

Poor throttle take-up

Porsche 928 S



J22

Poor throttle take-up

Porsche 928 S



ENGINE MISSING UNDER ALL OPERATING CONDITIONS

Trouble-shooting program according to customer complaint

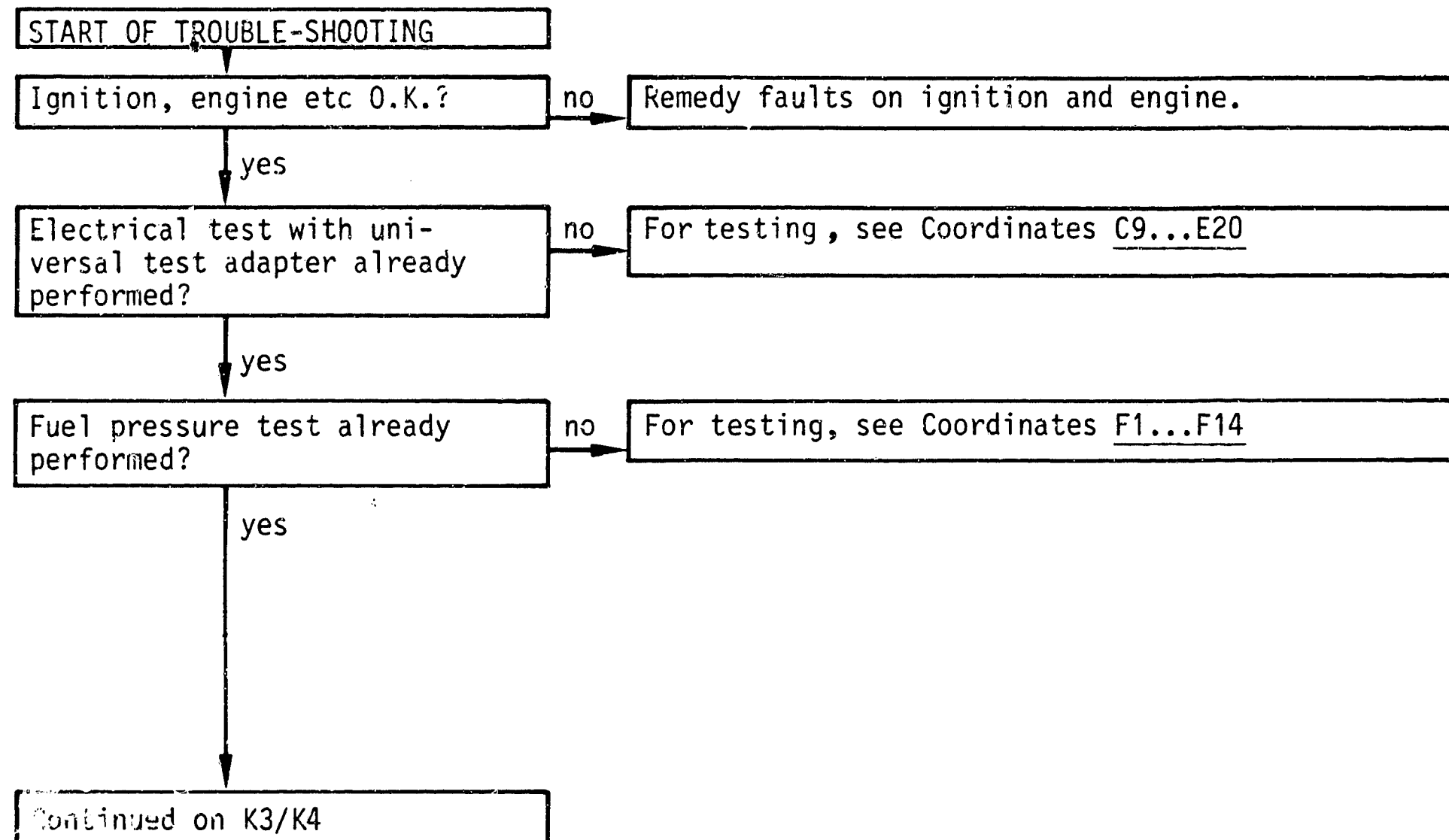
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row contains the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After the test has been completed, continue trouble-shooting at the point at which you branched off.



K1

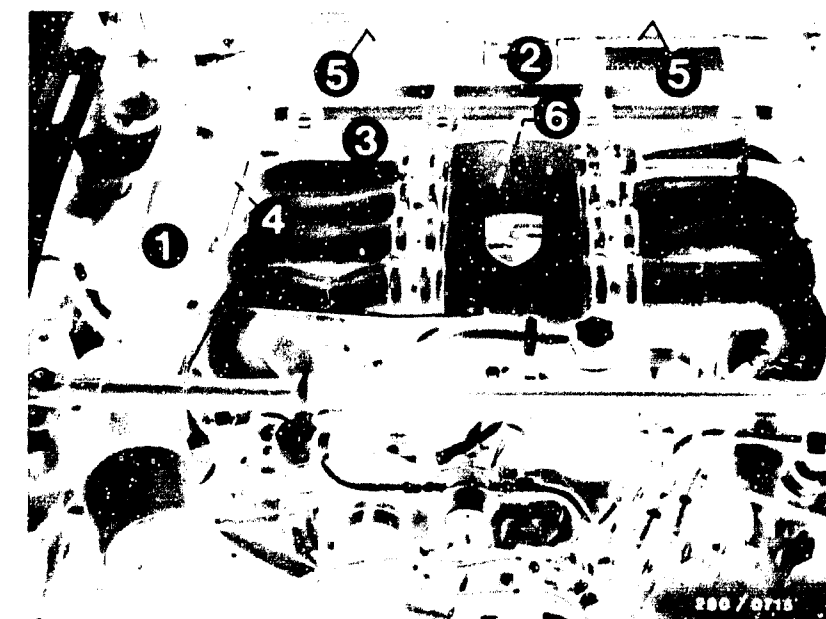
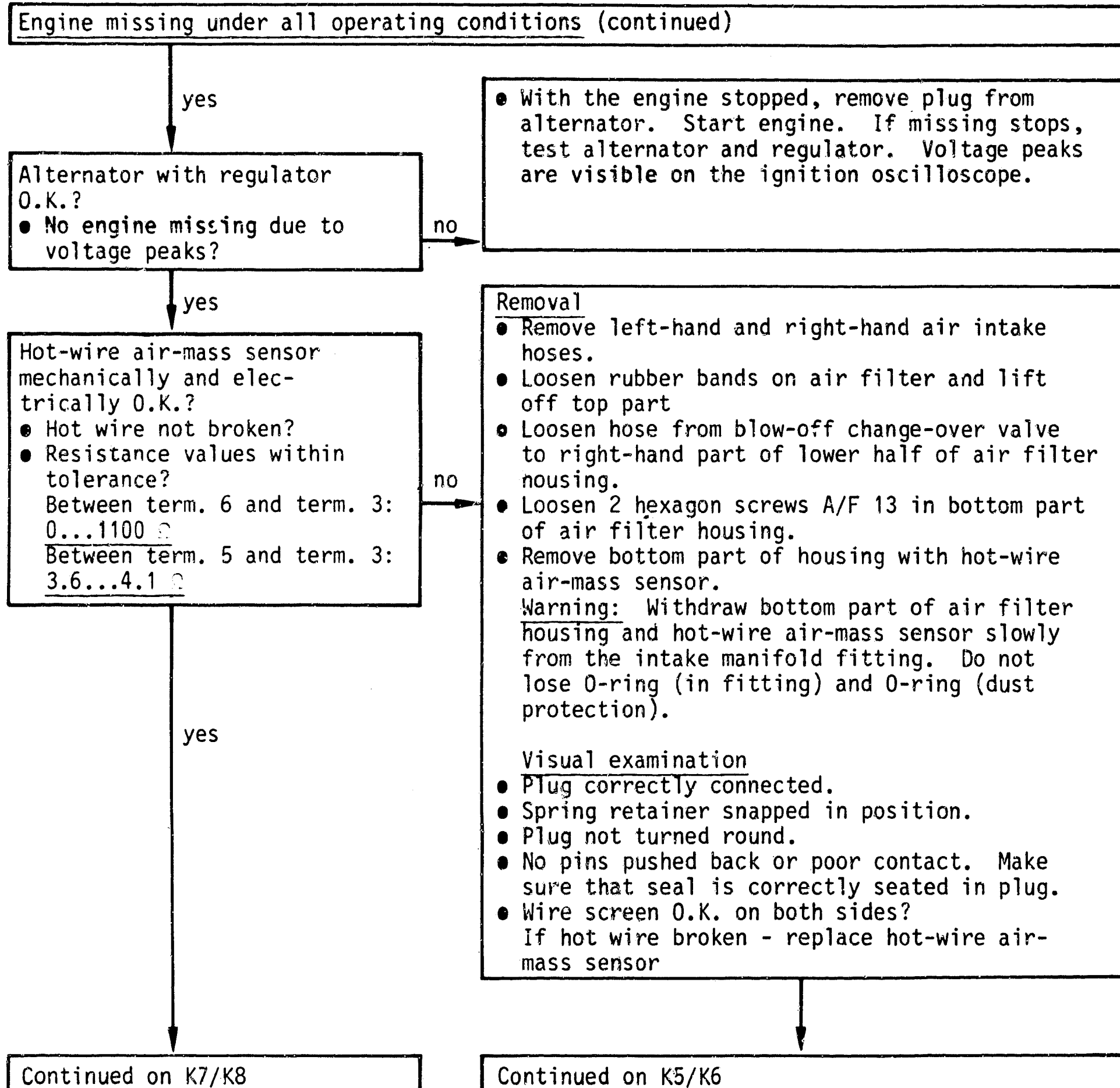
Engine missing under all op. conditions
Porsche 928 S



K2

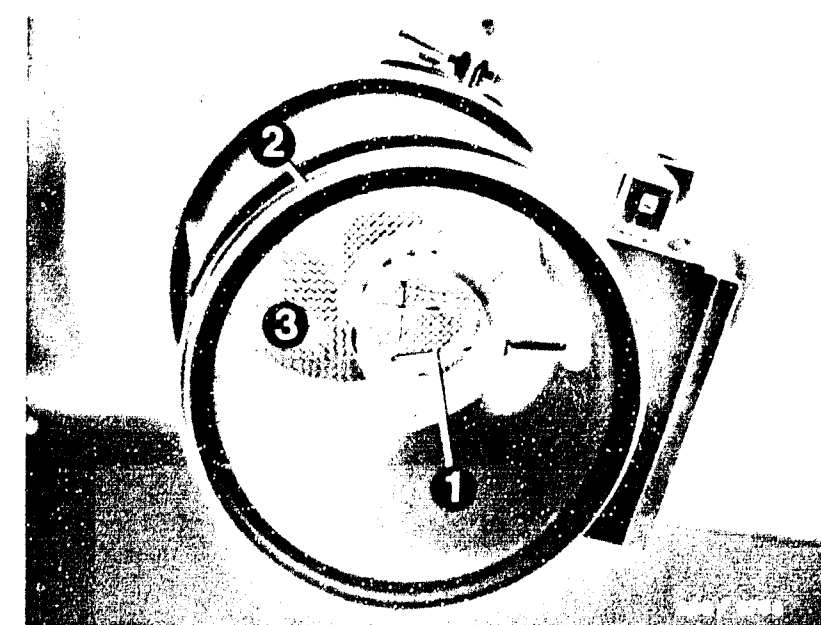
Engine missing under all op. conditions
Porsche 928 S





- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor

- 1 = Hot wire
- 2 = O-ring (dust protection)
- 3 = Wire screen



K3

Engine missing under all op. conditions
Porsche 928 S



K4

Engine missing under all op. conditions
Porsche 928 S

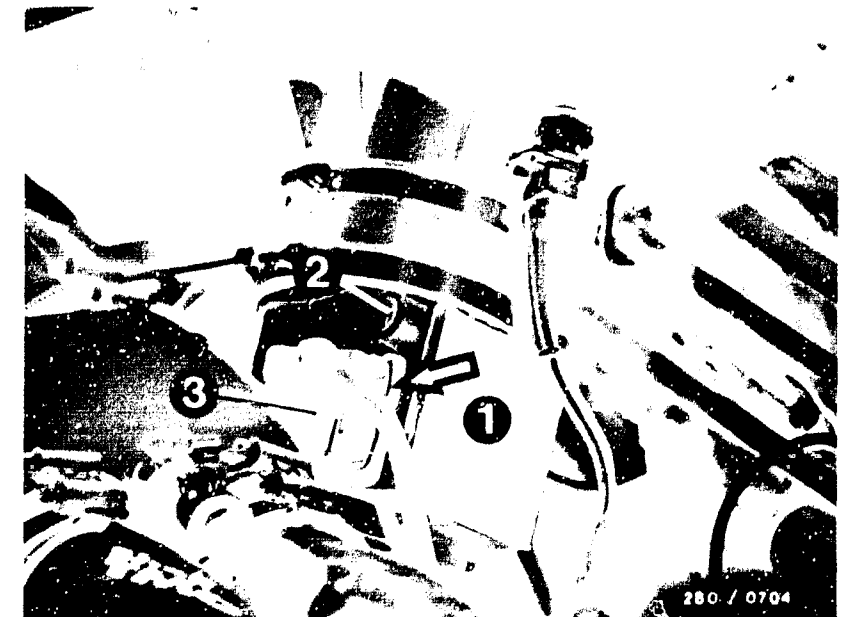


Engine missing under all operating conditions (continued)

yes

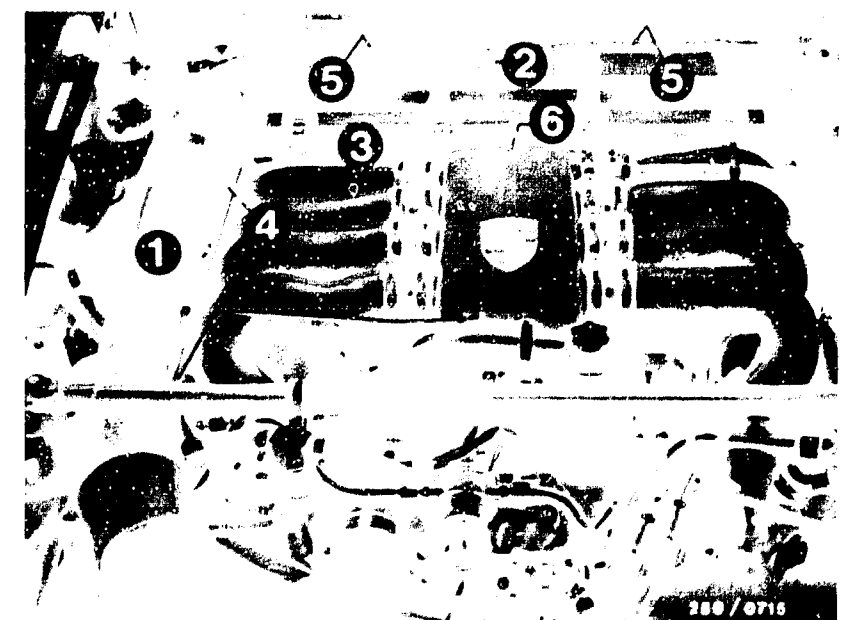
- Electrical test
 - Disconnect plug. Set multimeter/motortester to Ω range.
 - Resistance measurement
 - between term. 6 and term. 3:
0...1100 Ω
 - between term. 5 and term. 3:
3.6...4.1 Ω
 - If incorrect, replace hot-wire air-mass sensor.
- Installation
 - Connect plug to hot-wire air-mass sensor (right way round).
 - Lightly grease O-ring in fitting (use acid-free grease).
 - Ensure correct position of O-ring.
 - Provide idle-mixture-adjusting screw with red plug 1 280 508 012.
 - Carefully press bottom part of air filter housing with hot-wire air-mass sensor into intake manifold fitting. When mounting, pay attention to position and leak-tightness of O-ring and to accessibility of idle-mixture-adjusting screw when installed.
 - Fasten bottom part of air filter housing with both hexagon screws (A/F 13).
 - Re-fasten hose from blow-off change-over valve on bottom part of air filter housing.
 - Assemble air filter and fasten with rubber bands.
 - Correctly connect air intake hoses.

Continued on K7/K8



- 1 = Hot-wire air-mass sensor
- 3 = Plug
- Press retainer in direction of arrow when disconnecting plug

- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor



K5

Engine missing under all op. conditions
Porsche 928 S



K6

Engine missing under all op. conditions
Porsche 928 S



Engine missing under all operating conditions (continued)

yes

Fuel delivery of electric fuel pump O.K.?

Test specification:
min. 1350 cm³/30 s

no

yes

Continued on K9/K10

Measuring the fuel delivery:

For testing, undo junction between fuel return connection (of the two pressure regulators) and fuel return line (to fuel tank).

Connect hose and lead into a 5 l vessel with graduated scale.

Disconnect pump relay. Insert jumper between term. 87 and term. 30 in connection base.

Electric fuel pump must operate.

Test specification:

Min.: 1350 cm³/30 s

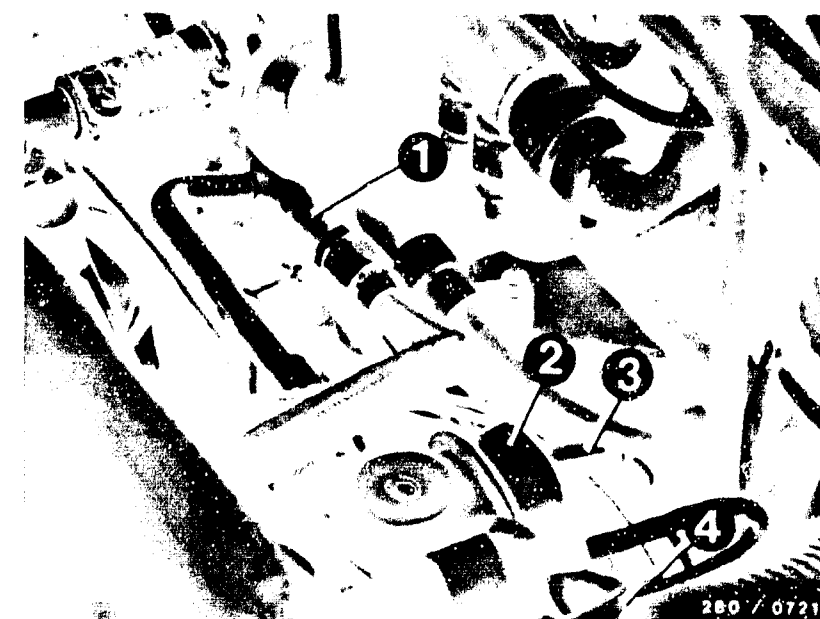
Caution:

Jumper must be removed again after testing is completed.

Remedy if test specification not obtained:

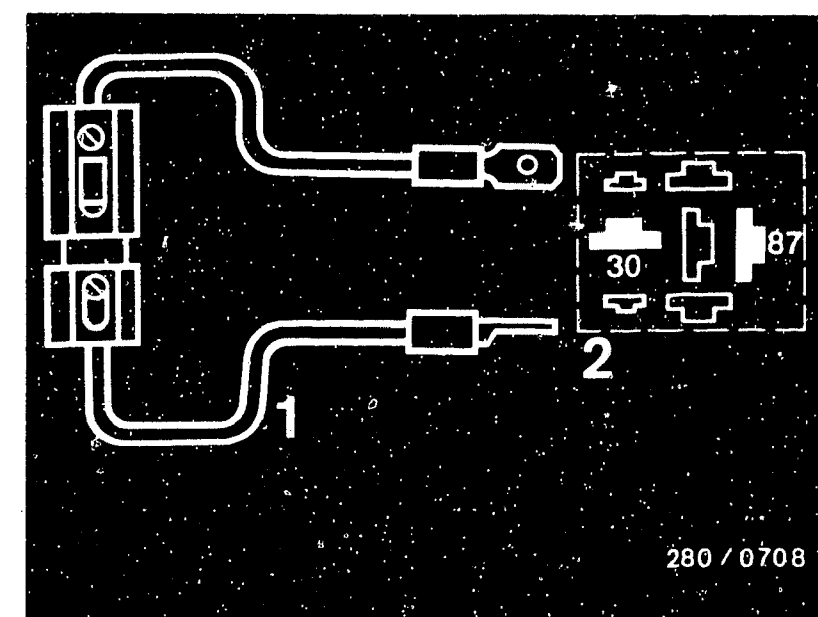
- Fuel filter clogged - replace.
- Voltage at terminals of electric fuel pump with engine running: min. 12 V. If not, clean contacts, possibly remedy poor ground connection, replace leads.
- Fuel pressure regulator defective - replace.
- If fuel delivery too low, replace electric fuel pump.

Testing completed: Remove jumper from connection base and connect pump relay. Re-connect fuel lines.



- 1 = Fuel return line
- 2 = Pressure regulator
- 3 = Intake manifold connection
- 4 = Fuel-distribution pipe (fuel delivery line)

- 1 = Jumper with fuse holder and 10 A fuse (user-fabricated)
- 2 = Top view of connection base



K7

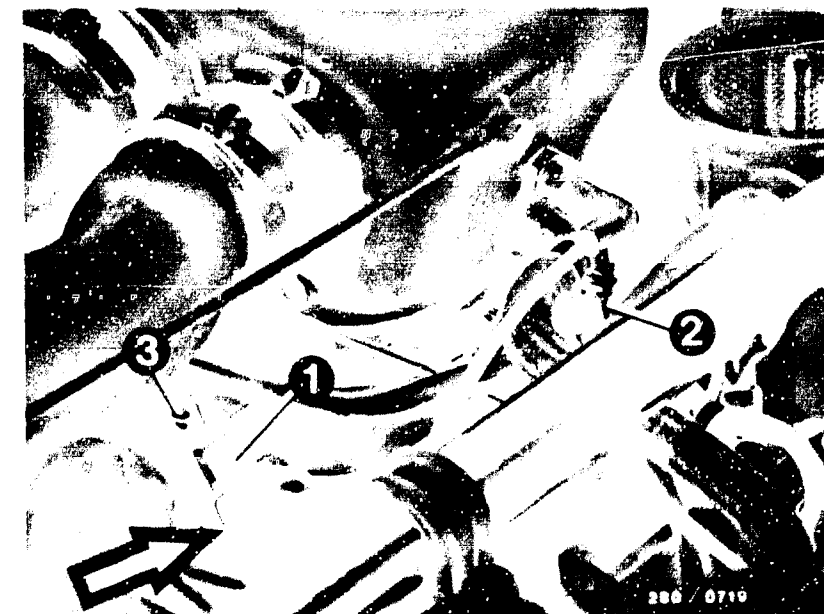
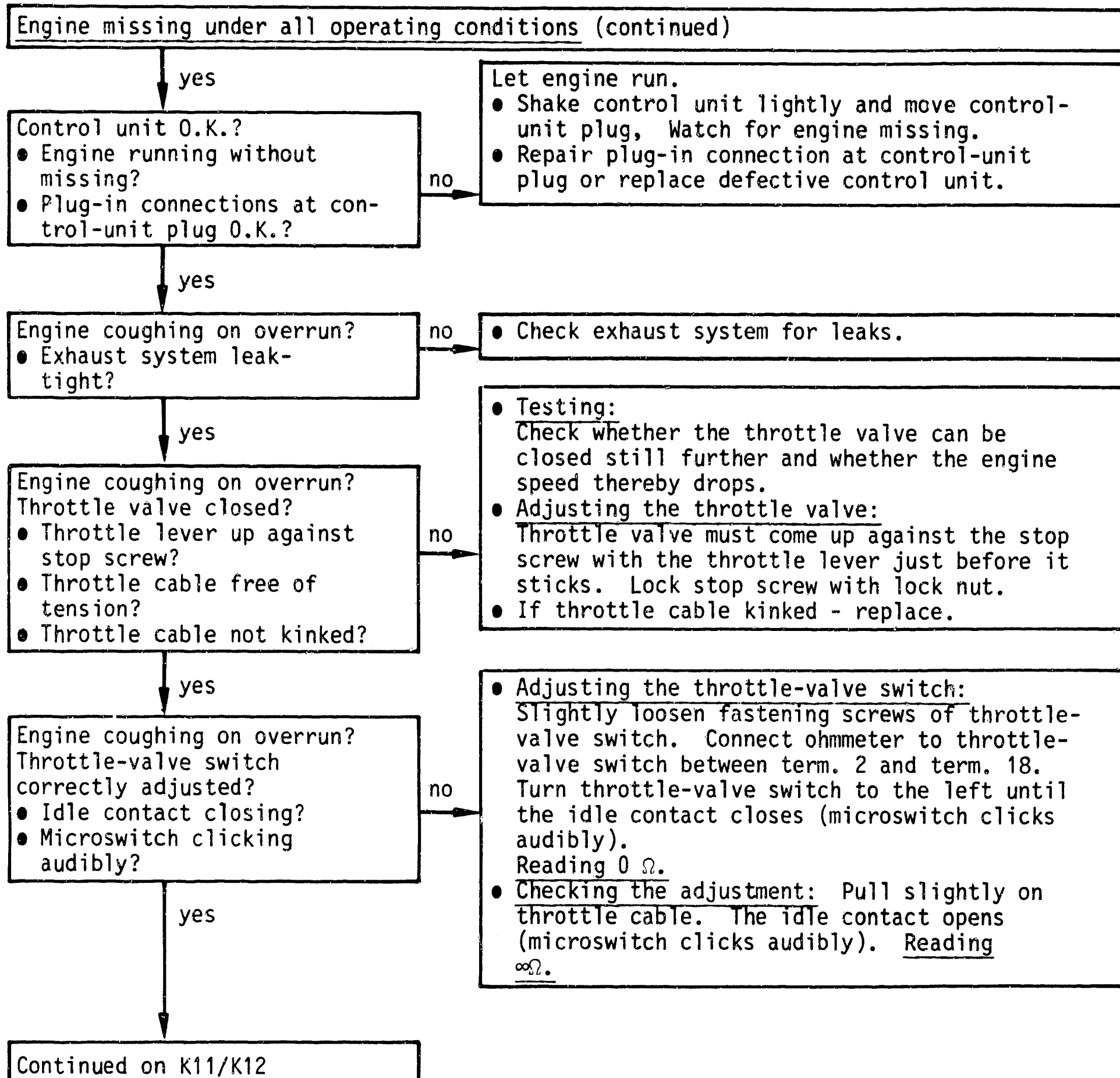
Engine missing under all op. conditions
Porsche 928 S



K8

Engine missing under all op. conditions
Porsche 928 S





1 = Throttle-valve switch
2 = Throttle-valve stop screw
3 = Fastening screws
Arrow = Press retainer to disconnect plug.

K9

Engine missing under all op. conditions
Porsche 928 S



K10

Engine missing under all op. conditions
Porsche 928 S



Engine missing under all operating conditions (continued)

yes

Engine coughing on overrun?
Overrun cutoff O.K.?

- Operation of control unit O.K.?
- Reinstatement speed O.K.?

Cold: 1900 min⁻¹
Warm: 1350 min⁻¹

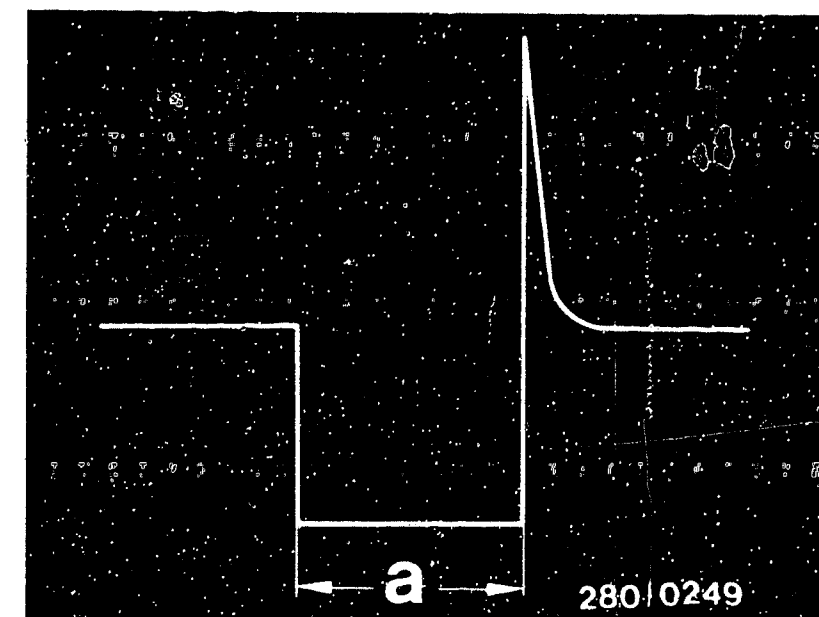
no

- Functional test of overrun cutoff:
Connect test lead as follows:
The two-pole plug connections of the test lead are connected between an injection valve and its connecting lead. Of the other two terminals of the test lead, only one need be connected to the special input of the motortester. If correctly connected, the pattern shown opposite is visible on the oscilloscope. Watch oscilloscope.
- Slowly raise engine speed to 3000 min⁻¹. Injection pulses must be visible on the oscilloscope. Release accelerator (idle position). No more injection pulses.
- Engine clearly below ambient temperature (+15°C...+30°C):
As of approx. 1900 min⁻¹ injection pulses must be visible again. The cutoff speed is approx. 250 min⁻¹ higher.
- Engine at normal operating temperature (approx. +80°C):
As of approx. 1350 min⁻¹ injection pulses must be visible again. The cutoff speed is approx. 250 min⁻¹ higher.

If incorrect, replace control unit.

yes

Continued on K13/K14



Injection pulse of a switched output stage
(Measured at the injection valve)
a = Pulse length (dependent on engine load)

K11

Engine missing under all op. conditions
Porsche 928 S



K12

Engine missing under all op. conditions
Porsche 928 S



Engine missing under all operating conditions (continued)

yes

Idle speed:
700...750 min⁻¹
CO concentration
(with engine at normal
operating temperature):
0.5...1.5 vol. % CO
(Australia, Sweden,
Switzerland version
0.5...1.0 vol. % CO)

(CO adjustment with sec-
ondary-air injection dis-
connected).

Idle speed and CO concen-
tration correctly ad-
justed?

no

Idle speed and CO adjustment

• Idle speed (adjusting)

Requirement: The adjusting operations must
be performed as quickly as possible so that
the intake passages do not heat up, thereby
falsifying the CO reading.

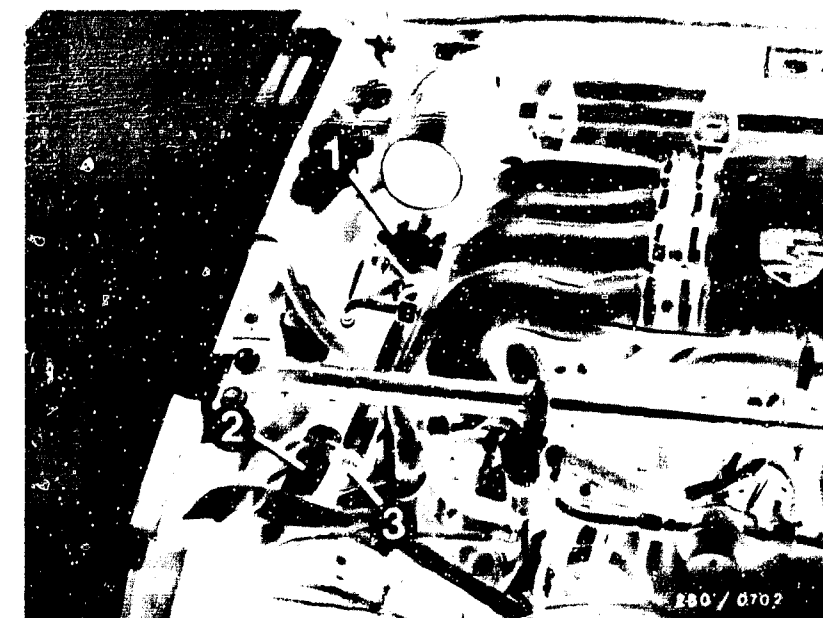
- Take off right-hand air intake hose.
- Pull off hose to air pump.
- Seal off pipe to blow-off change-over
valve (e.g. rubber sleeve from the door
Porsche Part No. 999. 703. 163. 40).
- Re-mount right-hand air intake hose.
- Bring engine to normal operating temperature.
- Connect motortester and exhaust-gas analyzer.
- Turn idle-air screw on throttle-valve
assembly until checking and setting value:
700...750 min⁻¹
is obtained.

Caution: Idle speed must not drop below
700 min⁻¹ since otherwise the ignition timing
is changed.

yes

Continued on K17/K18

Continued on K15/K16



- 1 = Blow-off change-over valve
2 = Hose to air pump
3 = Rubber sleeve

- 1 = Idle air screw for engine-speed
adjustment
2 = Screwdriver
3 = Temperature sensor (double NTC)



K13

Engine missing under all op. conditions
Porsche 928 S



K14

Engine missing under all op. conditions
Porsche 928 S



Engine missing under all operating conditions (continued)

• CO concentration

Adjusting:

Introduce special Porsche tool 9187 into the hexagon-socket-head cap screw A/F 3 of the air-mass sensor and turn the potentiometer appropriately for the idle mixture adjustment.

- Switch off exhaust extractor while measuring.

Observe safety regulations.

Checking and setting value:

0.5...1.5 vol. % CO

(Australia, Sweden, Switzerland version:

0.5...1.0 vol. % CO)

yes

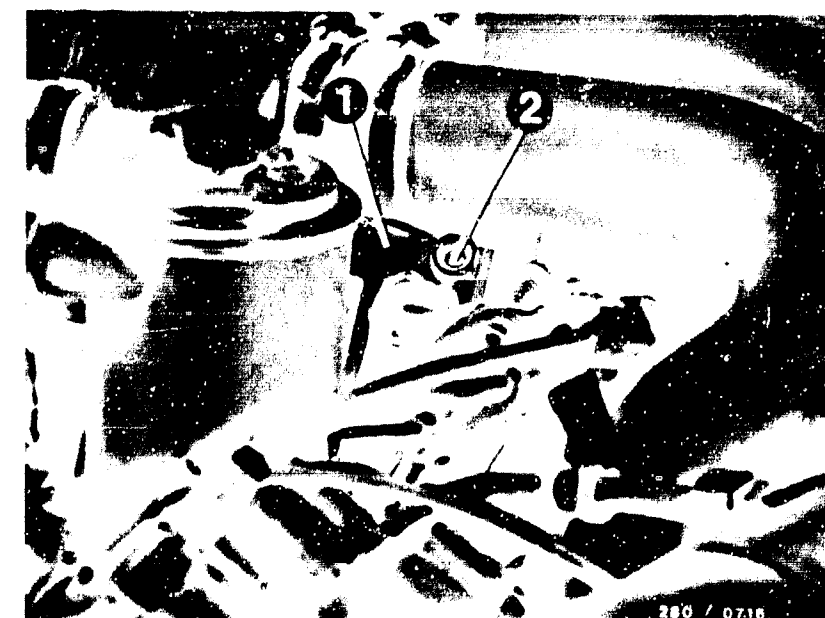
The Porsche 928 S is equipped as of 8.83 with secondary-air injection. Therefore, the above-explained procedure must be adopted for adjusting the idle speed and the CO concentration.

For all vehicles:

If CO concentration too high, turn CO adjusting screw in hot-wire air-mass sensor half a turn in a counterclockwise direction (hexagon-socket-head cap screw A/F 3 mm). Check idle speed and CO concentration again. If necessary, make corrections in several steps. After adjusting, use new, red plug (1 280 508 012).

Caution: Remove plug from air line and connect hose. Re-connect air intake hose if previously disconnected.

Continued on K17/K18



1 = Hot-wire air-mass sensor

2 = Mixture-adjusting screw

1 = Non-return valve

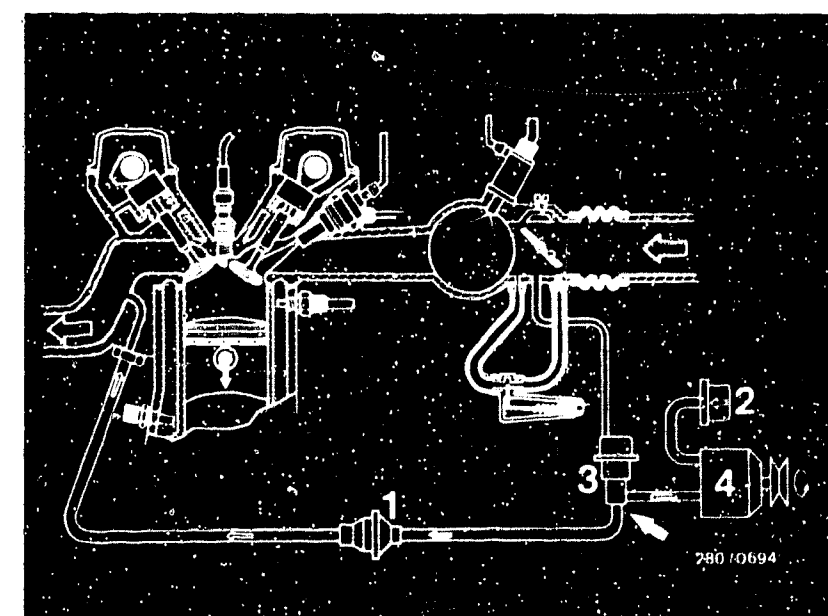
2 = Air filter for air pump

3 = Blow-off change-over valve

4 = Air pump

Arrow = Seal outlet.

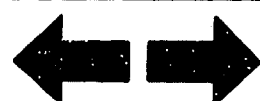
On the 928 S, seal air line from air pump to blow-off change-over valve.



K15

Engine missing under all op. conditions

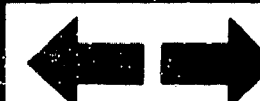
Porsche 928 S



K16

Engine missing under all op. conditions

Porsche 928 S



Engine missing under all operating conditions (continued)

Injection valves checked for proper operation?
Injection signal checked for missing?

- Injection pulses without interference or missing?
- Leads correctly routed?
- No loose contacts in plug-in connections?

no

- Connect test lead as follows:
The two-pole plug connections of the test lead are connected between an injection valve and its connecting lead. Of the other two connection terminals of the test lead, only one need be connected to the special input of the motortester.
- If correctly connected, the pattern shown opposite is visible on the oscilloscope. With the aid of the test lead it is possible to test the injection pulses at the injection valves with an ignition oscilloscope with the engine running. If the pattern shown opposite is not obtained or if deviations (interference, missing etc) are visible, the other injection valves should also be tested.
- In case of interference: Check routing of leads.
- In case of missing: Eliminate loose contacts in the leads or in the plug-in connections.

yes

Injection valve mechanically O.K.?
• Does engine speed drop when injection-valve connectors are pulled off individually?

no

- With the engine running, disconnect injection-valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve O.K.

yes

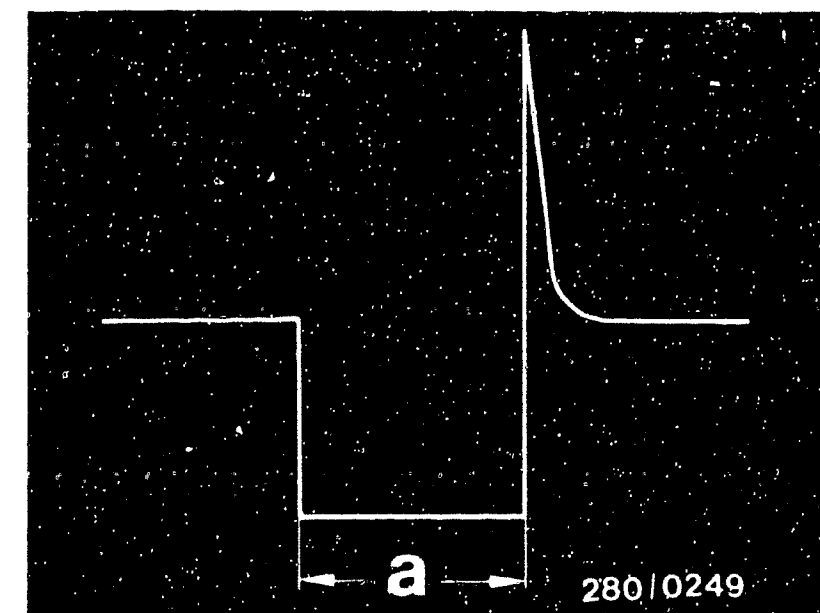
Injection valves O.K.?
• Removal and installation

no

- Removal
Removal fuel-distribution pipes with injection valves.
- Remove air intake hoses, air filter with top and bottom parts with hot-wire air-mass sensor.

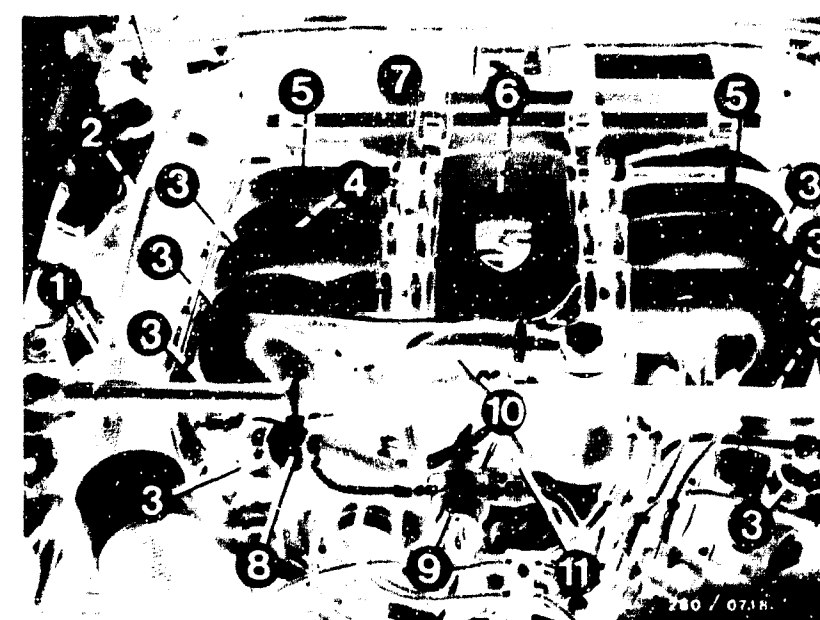
Continued on K19/K20

Continued on K19/K20



Injection pulses of a switched output stage
(Measured at the injection valve)
a = Pulse length (dependent on engine load)

3 = Injection valves



Engine missing under all operating conditions (continued)

yes

- Loosen fastening screws on fuel-distribution pipe and on injection valves.
- Loosen strut.
- Loosen intake manifold connection.
- Pull all 8/4 injection valves simultaneously and carefully out of the cylinder.
If injection valves defective on one side, loosen fuel-distribution pipe at pressure regulator.
- Pull off electrical connection.
- Break open hose-termination sleeve on fuel-distribution pipe.
- Cut open hose in longitudinal direction with soldering iron and remove injection valve.
Caution: Do not allow escaping fuel to drip onto hot parts of the engine.
Warning: Before installing, the rubber seals at the valve mouth sleeve may be greased only lightly (silicone grease Ft 2 v 1). The other parts must remain grease-free.
- Installation
 - Plug on hose-termination sleeve (fuel-distribution pipe).
 - Plug on new injection valve (make sure there are no leaks).

Install the further components so that the original condition is re-established.

yes

Trouble-shooting program completed for customer complaint

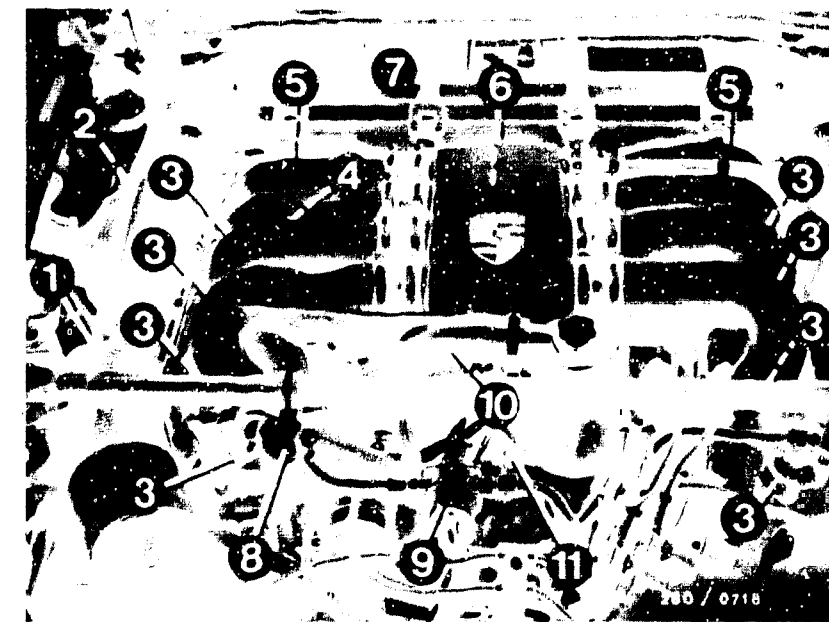
"Engine missing under all operating conditions".

Fault eliminated?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8).
If the fault has not been detected with the "direct trouble-shooting chart", see "detailed trouble-shooting chart" (Coordinates C3...C4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



3 = Injection valves

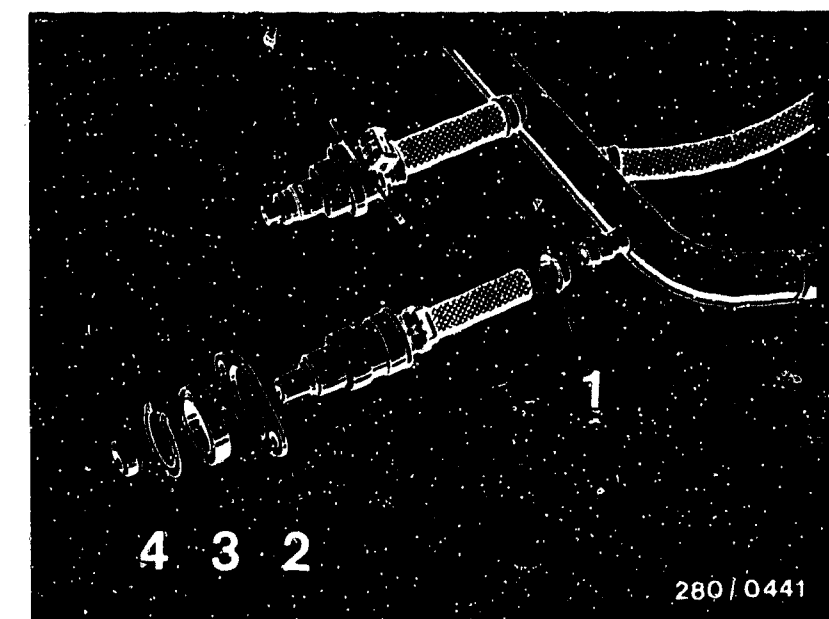
Similar to Porsche 928 S

1 = Hose-termination sleeve

2 = Holder

3 = Rubber seal

4 = Retainer



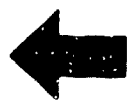
K19

Engine missing under all op. conditions
Porsche 928 S



K20

Engine missing under all op. conditions
Porsche 928 S



FUEL CONSUMPTION TOO HIGH

Trouble-shooting program according to customer complaint

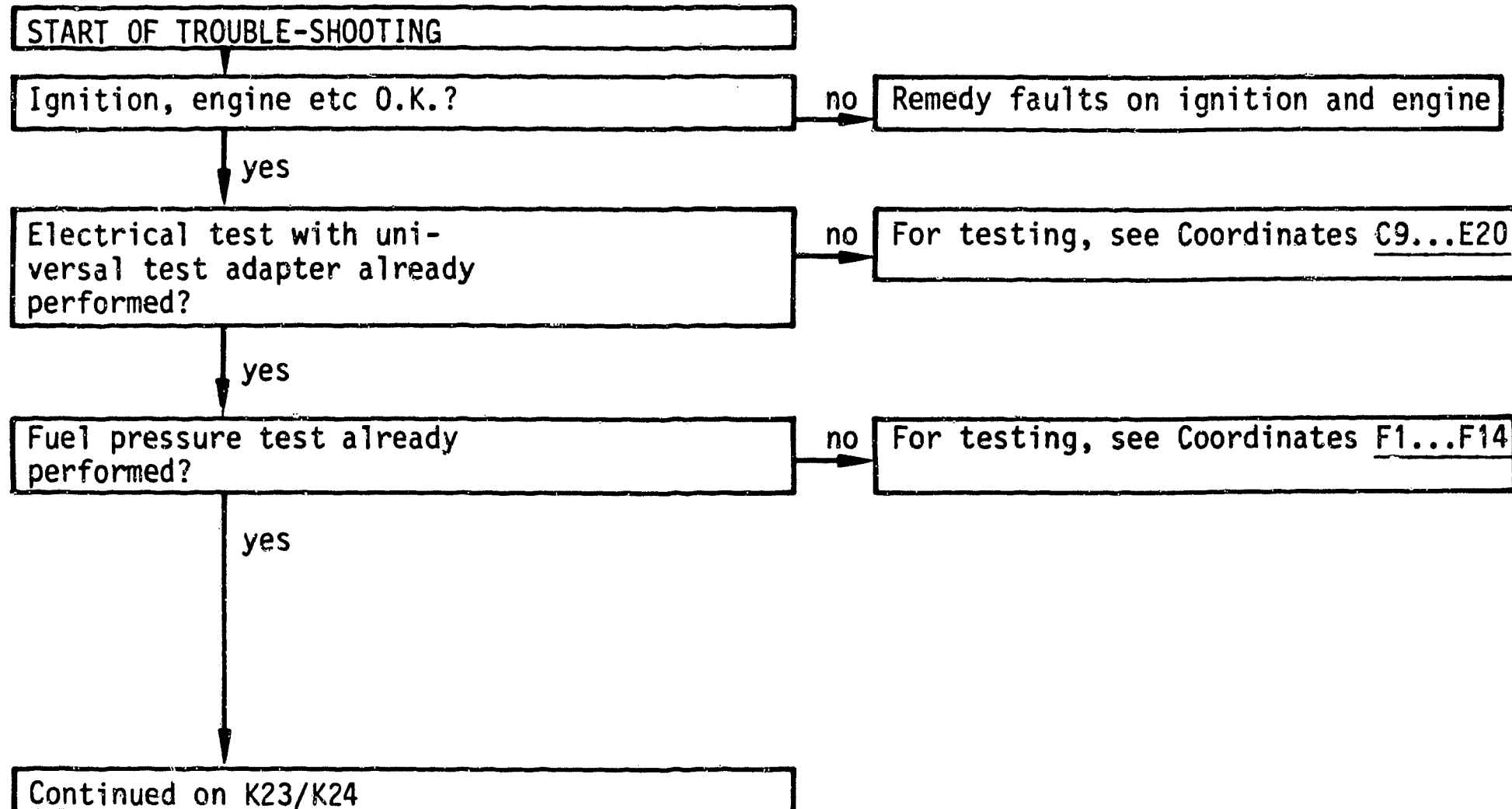
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row contains the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After the test has been completed, continue trouble-shooting at the point at which you branched off.



K21

Fuel consumption too high
Porsche 928 S



K22

Fuel consumption too high
Porsche 928 S



Fuel consumption too high (continued)

yes

Hot-wire air-mass sensor mechanically and electrically O.K.?

- Hot wire not broken?
- Resistance values within tolerance?
Between term. 6 and term. 3:
 $0...1100\ \Omega$
Between term. 5 and term. 3:
 $3.6...4.1\ \Omega$

no

Removal

- Remove left-hand and right-hand air intake hoses.
- Loosen rubber bands on air filter and lift off top part
- Loosen hose from blow-off change-over valve to right-hand part of lower half of air filter housing.
- Loosen 2 hexagon screws A/F 13 in bottom part of air filter housing.
- Remove bottom part of housing with hot-wire air-mass sensor.

Warning: Withdraw bottom part of air filter housing and hot-wire air-mass sensor slowly from the intake manifold fitting. Do not lose O-ring (in fitting) and O-ring (dust protection).

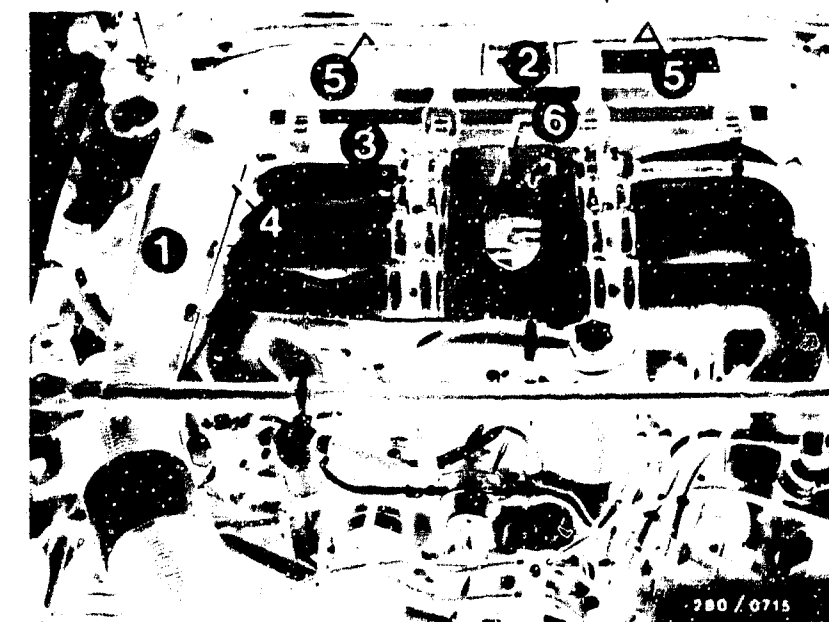
Visual examination

- Plug correctly connected.
- Spring retainer snapped in position.
- Plug not turned round.
- No pins pushed back or poor contact. Make sure that seal is correctly seated in plug.
- Wire screen O.K. on both sides?
If hot wire broken - replace hot-wire air-mass sensor.

yes

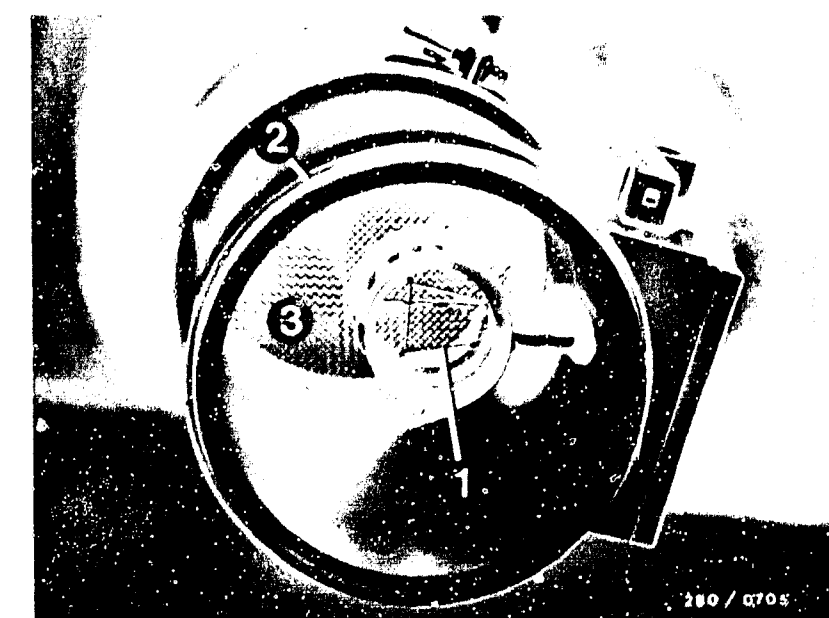
Continued on L3/L4

Continued on L1/L2



- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor

- 1 = Hot wire
- 2 = O-ring (dust protection)
- 3 = Wire screen



K23

Fuel consumption too high
Porsche 928 S



K24

Fuel consumption too high
Porsche 928 S



Fuel consumption too high (continued)

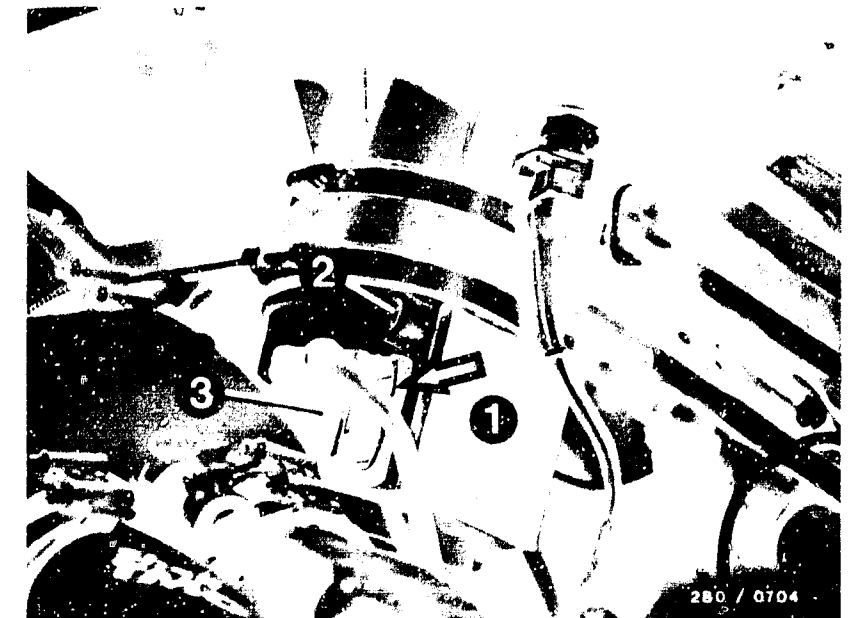
yes

● Electrical test

- Disconnect plug. Set multimeter/motortester to Ω range.
Resistance measurement
between term. 6 and term. 3:
0...1100 Ω
between term. 5 and term. 3:
3.6...4.1 Ω
If incorrect, replace hot-wire air-mass sensor.

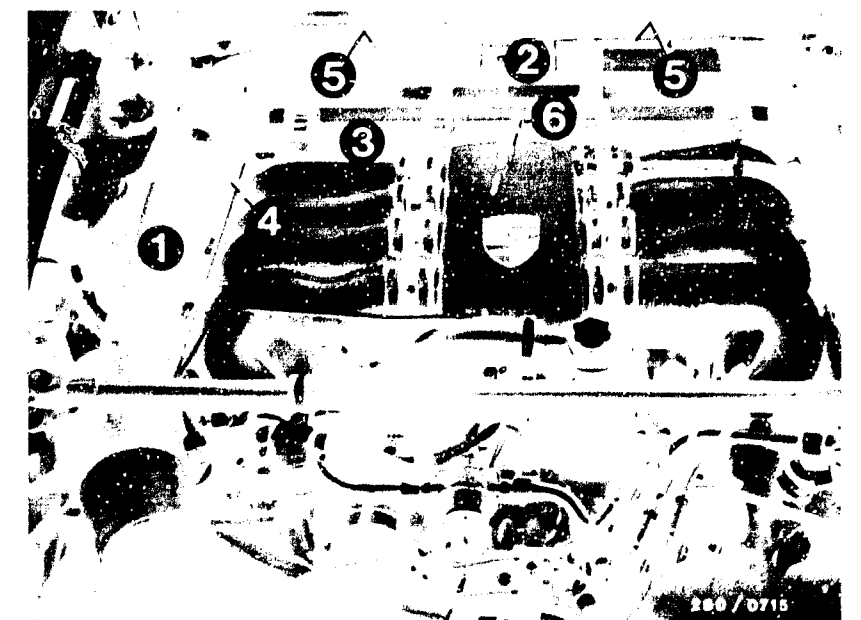
Installation

- Connect plug to hot-wire air-mass sensor (right way round).
- Lightly grease O-ring in fitting (use acid-free grease).
Ensure correct position of O-ring.
- Provide idle-mixture-adjusting screw with red plug 1 280 508 012.
- Carefully press bottom part of air filter housing with hot-wire air-mass sensor into intake manifold fitting. When mounting, pay attention to position and leak-tightness of O-ring and to accessibility of idle-mixture-adjusting screw when installed.
- Fasten bottom part of air filter housing with both hexagon screws (A/F 13).
- Re-fasten hose from blow-off change-over valve on bottom part of air filter housing.
- Assemble air filter and fasten with rubber bands.
- Correctly connect air intake hoses.



- 1 = Hot-wire air-mass sensor
- 3 = Plug
Press retainer in direction of arrow when disconnecting plug

- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor



Continued on L3/L4

L1

Fuel consumption too high
Porsche 928 S



L2

Fuel consumption too high
Porsche 928 S



Fuel consumption too high (continued)

yes

Idle speed:
700...750 min⁻¹
CO concentration
(with engine at normal
operating temperature).
0.5...1.5 vol. % CO
(Australia, Sweden,
Switzerland version
0.5...1.0 vol. % CO)

(CO adjustment with second-
ary-air injection dis-
connected).

Idle speed and CO concen-
tration correctly ad-
justed?

yes

Continued on L7/L8

no

Idle speed and CO adjustment

• Idle speed (adjusting)

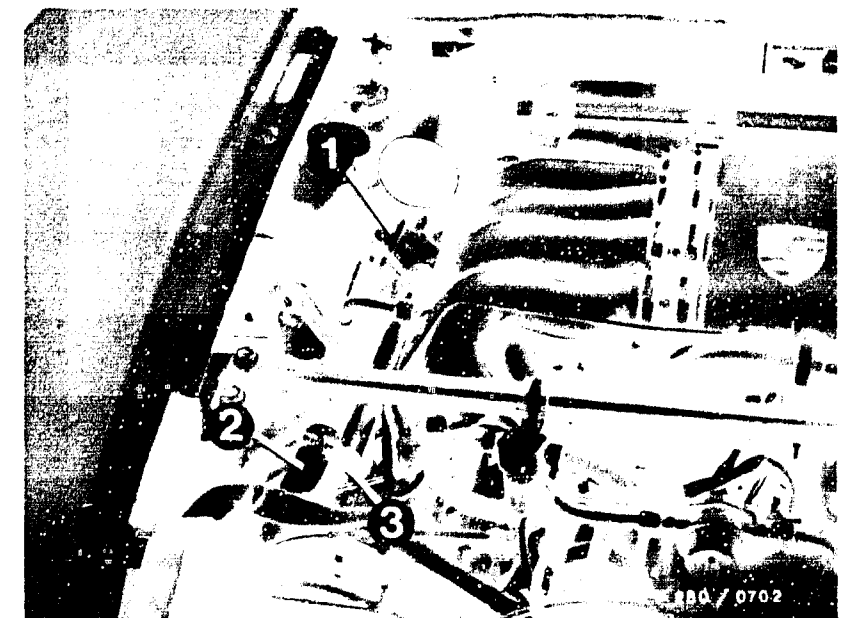
Requirement: The adjusting operations must
be performed as quickly as possible so that
the intake passages do not heat up, thereby
falsifying the CO reading.

- Take off right-hand air intake hose.
- Pull off hose to air pump.
- Seal off pipe to blow-off change-over
valve (e.g. rubber sleeve from the door
Porsche Part No. 999. 703. 163. 40).
- Re-mount right-hand air intake hose.
- Bring engine to normal operating temperature.
- Connect motortester and exhaust-gas analyzer.
- Turn idle-air screw on throttle-valve
assembly until checking and setting value:
700...750 min⁻¹

is obtained.

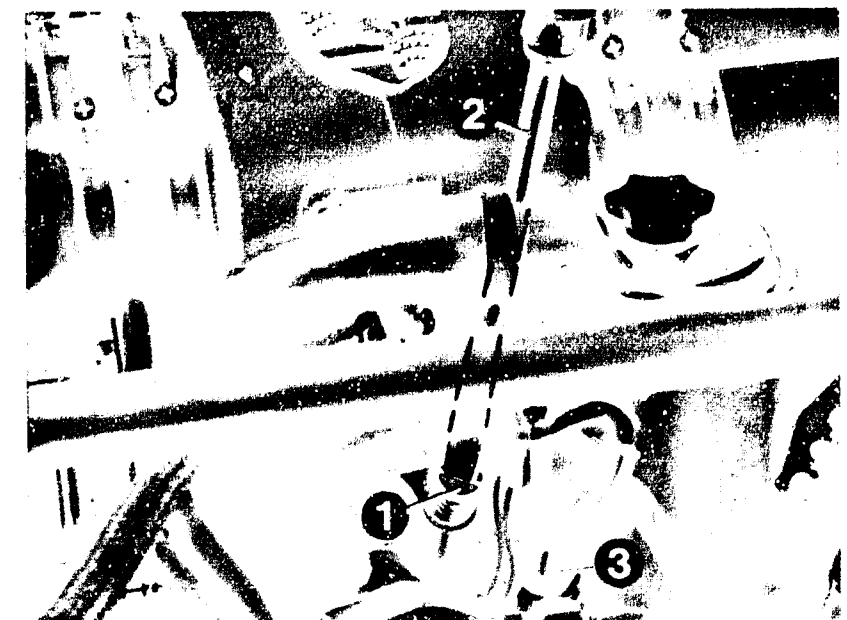
Caution: Idle speed must not drop below
700 min⁻¹ since otherwise the ignition timing
is changed.

Continued on L5/L6



1 = Blow-off change-over valve
2 = Hose to air pump
3 = Rubber sleeve

1 = Idle air screw for engine-speed
adjustment
2 = Screwdriver
3 = Temperature sensor (double NTC)



L3

Fuel consumption too high
Porsche 928 S



L4

Fuel consumption too high
Porsche 928 S



Fuel consumption too high (continued)

yes

• CO concentration

Adjusting:

Introduce special Porsche tool 9187 into the hexagon-socket-head cap screw A/F 3 of the air-mass sensor and turn the potentiometer appropriately for the idle mixture adjustment.

- Switch off exhaust extractor while measuring. Observe safety regulations.

Checking and setting value:

0.5...1.5 vol. % CO

(Australia, Sweden, Switzerland version:

0.5...1.0 vol. % CO

The Porsche 928 S is equipped as of 8.83 with secondary-air injection. Therefore, the above-explained procedure must be adopted for adjusting the idle speed and the CO concentration.

For all vehicles:

If CO concentration too high, turn CO adjusting screw in hot-wire air-mass sensor half a turn in a counterclockwise direction (hexagon-socket-head cap screw A/F 3 mm). Check idle speed and CO concentration again. If necessary, make corrections in several steps. After adjusting, use new, red plug (1 280 508 012).

Caution: Remove plug from air line and connect hose. Re-connect air intake hose if previously disconnected.

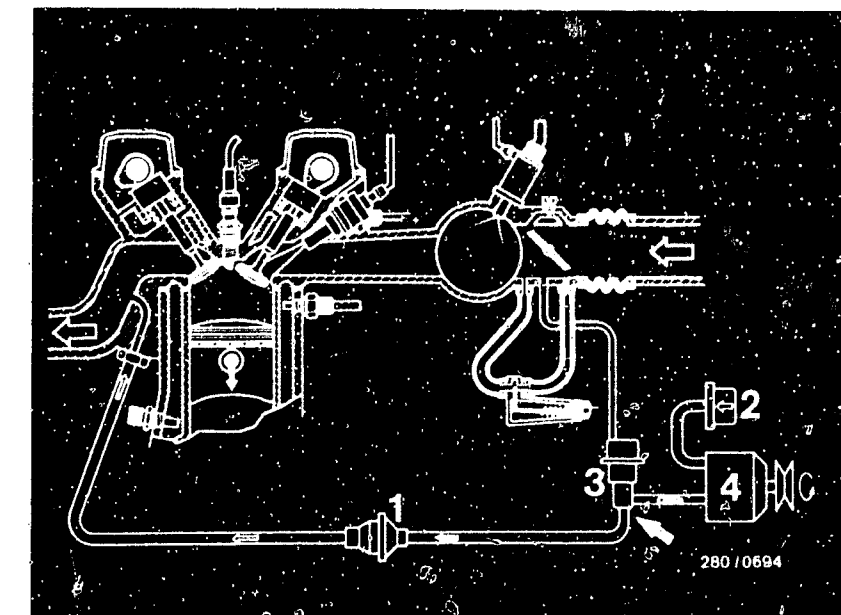


- 1 = Hot-wire air-mass sensor
- 2 = Mixture-adjusting screw

- 1 = Non-return valve
- 2 = Air filter for air pump
- 3 = Blow-off change-over valve
- 4 = Air pump

Arrow = Seal outlet.

On the 928 S, seal air line from air pump to blow-off change-over valve.



Continued on L7/L8

L5

Fuel consumption too high
Porsche 928 S



L6

Fuel consumption too high
Porsche 928 S



Fuel consumption too high (continued)

yes

Have all brakes released fully?

no

Adjust handbrake/drum brake so that there is no friction.

yes

Injection valve mechanically O.K.?

- Does engine speed drop when injection-valve connectors are pulled off individually?

no

- With engine running, disconnect injection-valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve O.K.

yes

Injection valves O.K.?

- Removal and installation

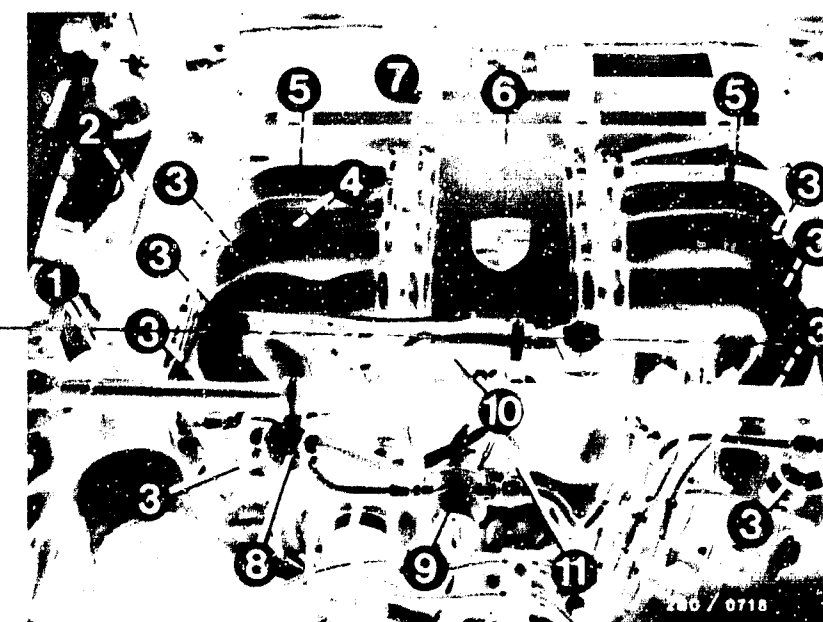
no

- Removal
 - Remove fuel-distribution pipes with injection valves.
 - Remove air-intake hoses, air filter with top and bottom parts (with hot-wire air-mass sensor).
 - Loosen fastening screws on fuel-distribution pipe and on injection valves.
 - Loosen strut.
 - Loosen intake manifold connection.
 - Pull all 8/4 injection valves simultaneously and carefully out of the cylinder head.
- If injection valves defective on one side, loosen fuel-distribution pipe at pressure regulator.
- Caution: Make sure that no fuel gets onto hot parts of the engine.

yes

Continued on L9/L10

Continued on L9/L10



3 = Injection valves

L7

Fuel consumption too high
Porsche 928 S



L8

Fuel consumption too high
Porsche 928 S



Fuel consumption too high (continued)

yes

yes

- Pull off electrical connection.
- Break open hose-termination sleeve on fuel-distribution pipe.
- Cut open hose in longitudinal direction with soldering iron and remove injection valve.
Caution: Do not allow escaping fuel to drip onto hot parts of the engine.
- Warning: Before installing, the rubber seals at the valve mouth sleeve may be greased only lightly (silicone grease Ft 2 v 1). The other parts must remain grease-free.

Installation

- Plug on hose-termination sleeve (fuel-distribution pipe).
- Plug on new injection valve (make sure there are no leaks).

Install the further components so that the original condition is re-established.

Trouble-shooting program completed for customer complaint

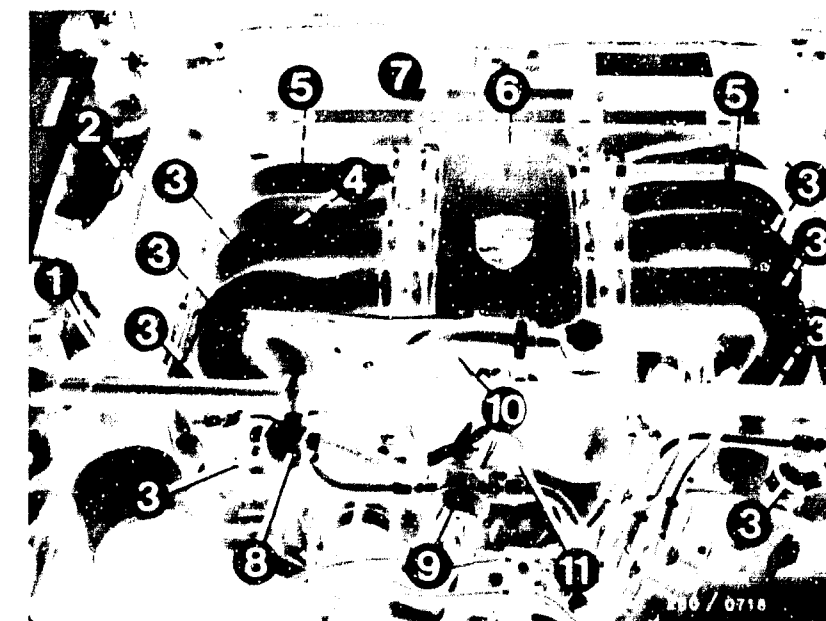
"Fuel consumption too high"

Fault eliminated?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8).
If the fault has not been detected with the "direct trouble-shooting chart", see "detailed trouble-shooting chart" (Coordinates C3...C4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



3 = Injection valves

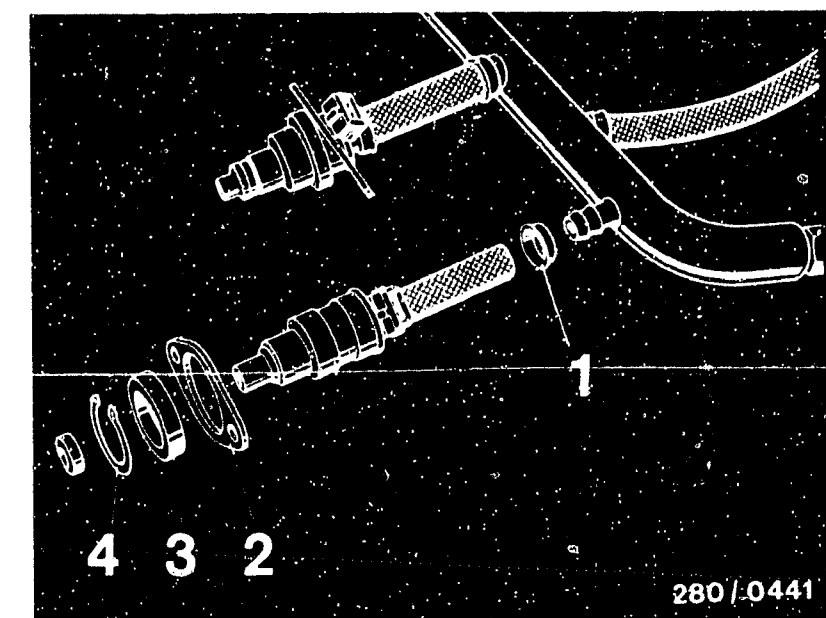
Similar to Porsche 928 S

1 = Hose-termination sleeve

2 = Holder

3 = Rubber seal

4 = Retainer



L9

Fuel consumption too high
Porsche 928 S



L10

Fuel consumption too high
Porsche 928 S



MAXIMUM ENGINE POWER, TOP SPEED NOT REACHED

Trouble-shooting program according to customer complaint

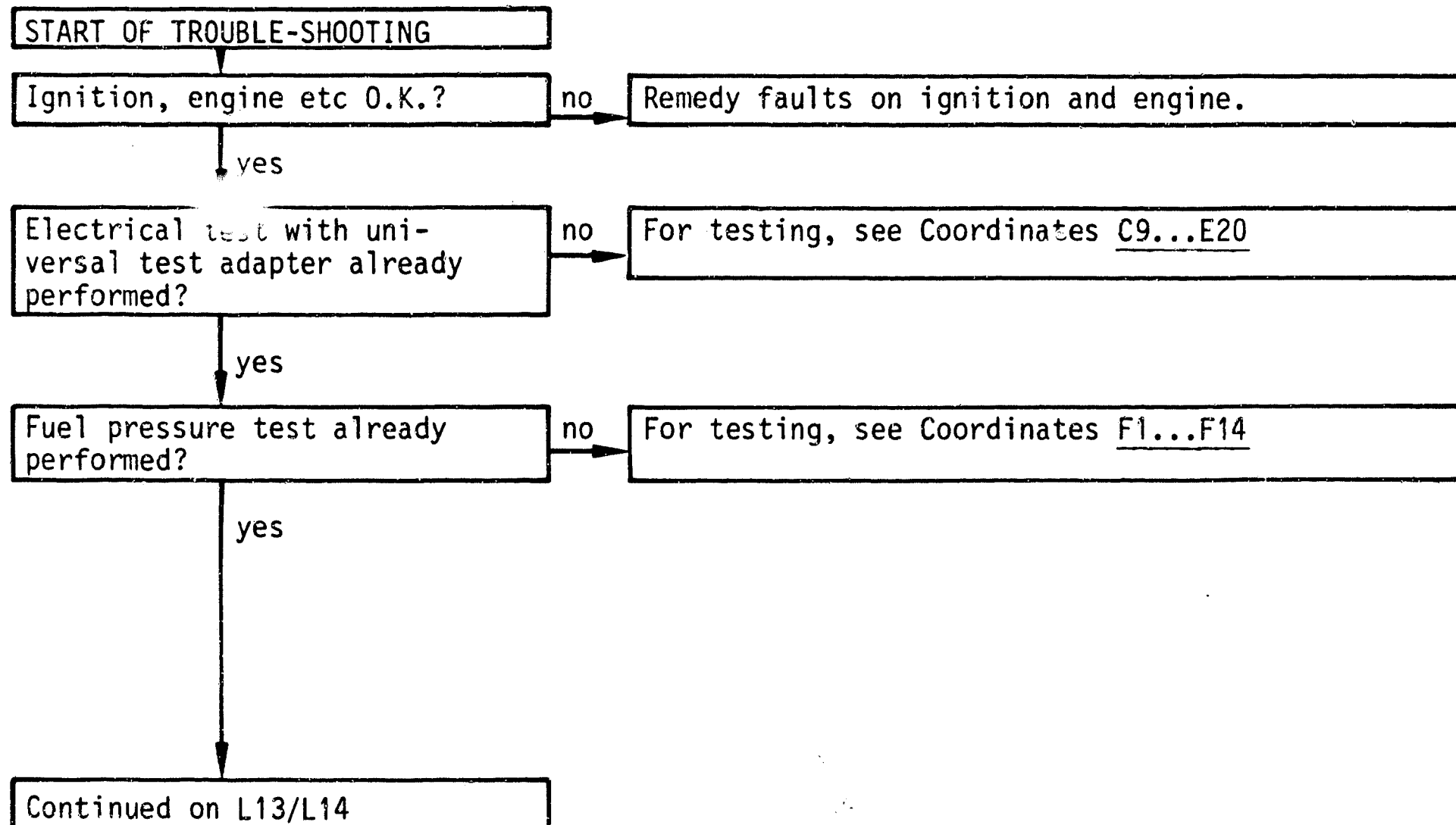
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row contains the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After the test has been completed, continue trouble-shooting at the point at which you branched off.



L11

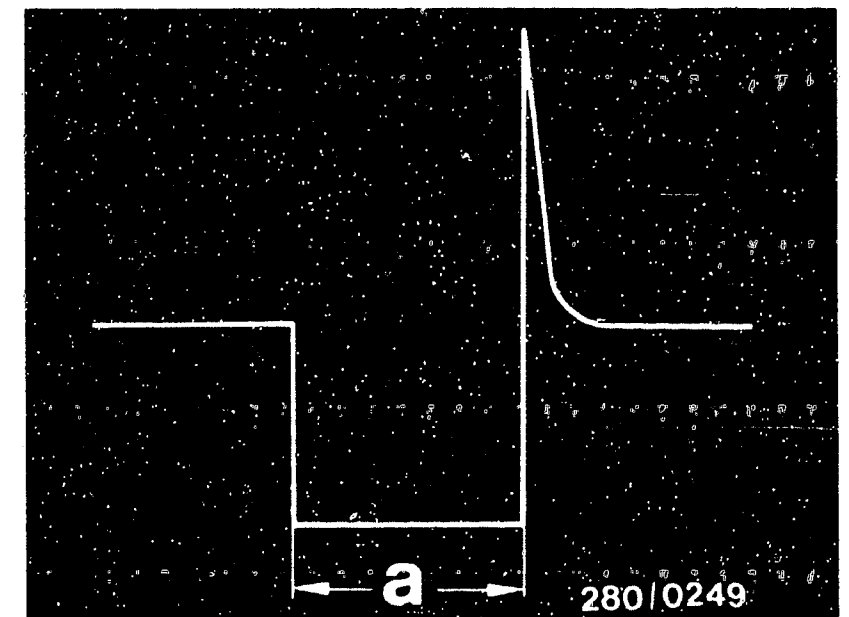
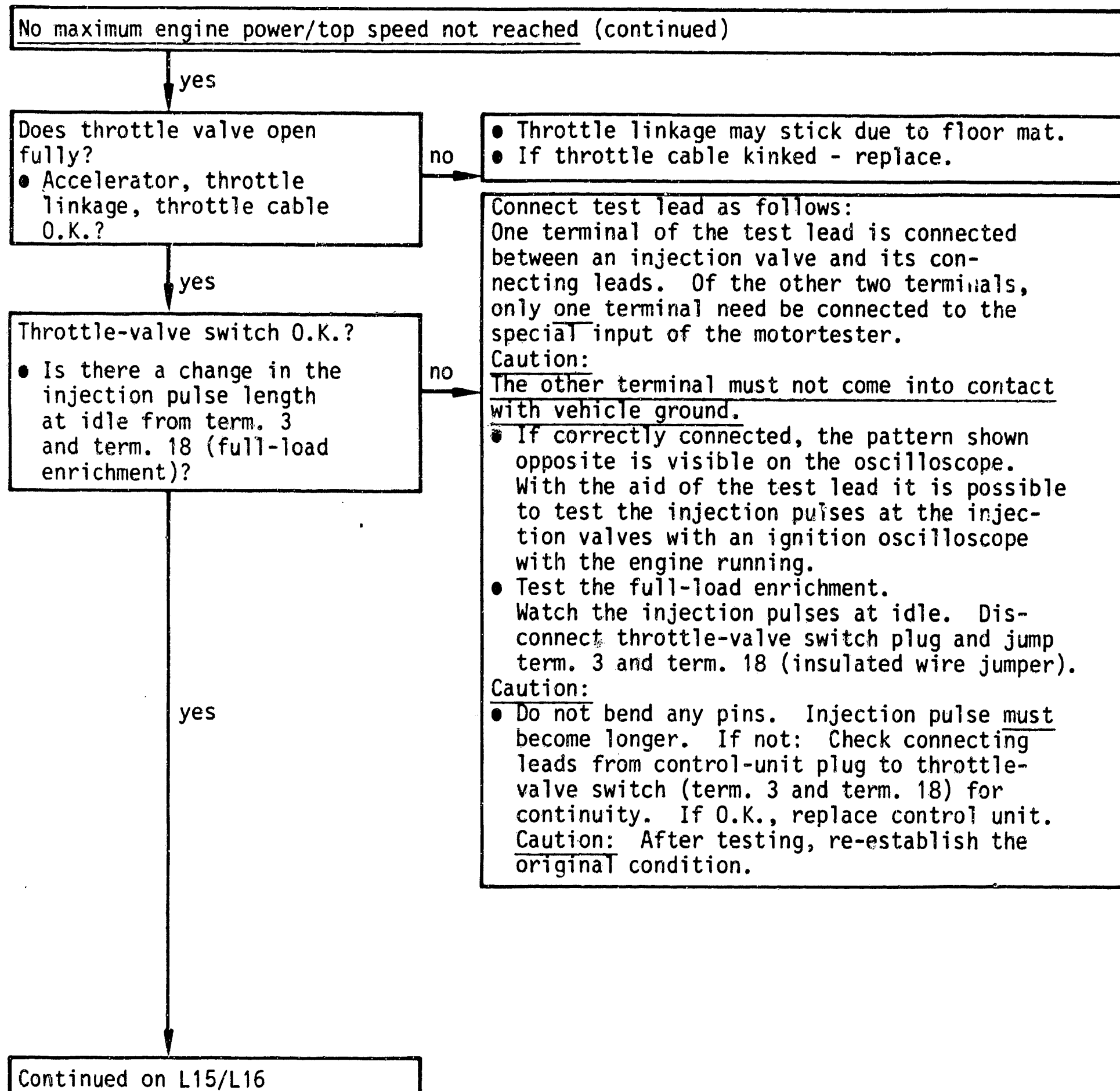
No maximum engine power
Porsche 928 S



L12

No maximum engine power
Porsche 928 S





Injection pulse of a switched output stage (measured at the injection valve)
 a = Pulse length (dependent on engine load)

L13

No maximum engine power

Porsche 928 S



L14

No maximum engine power

Porsche 928 S



Maximum engine power/top speed not reached (continued)

yes

Fuel delivery of electric fuel pump O.K.?

Test specification:
min. 1350 cm³/30 s

no

yes

Measuring the fuel delivery:

For testing, undo junction between fuel return connection (of the two pressure regulators) and fuel return line (to fuel tank). Connect hose and lead into a 5 l vessel with graduated scale. Disconnect pump relay. Insert jumper between term. 87 and term. 30 in connection base. Electric fuel pump must operate.

Test specification:

Min.: 1350 cm³/30 s

Caution:

Jumper must be removed again after testing is completed.

Remedy if test specification not obtained:

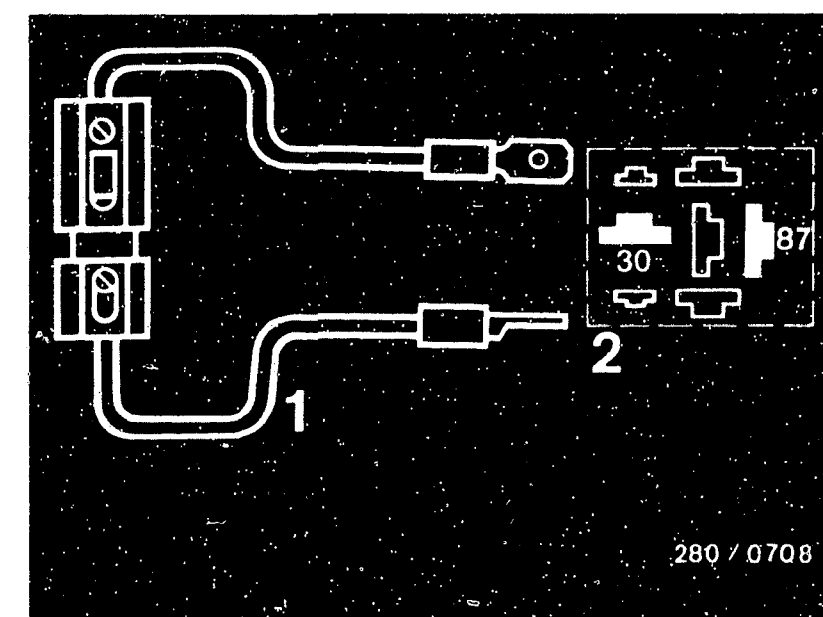
- Fuel filter clogged - replace.
- Voltage at terminals of electric fuel pump with engine running: min. 12 V. If not, clean contacts, possibly remedy poor ground connection, replace leads.
- Fuel pressure regulator defective - replace.
- If fuel delivery too low, replace electric fuel pump.

Testing completed: Remove jumper from connection base and connect pump relay. Re-connect fuel lines.



- 1 = Fuel return line
- 2 = Pressure regulator
- 3 = Intake manifold connection
- 4 = Fuel-distribution pipe (fuel delivery line)

- 1 = Jumper with fuse holder and 10 A fuse (user-fabricated)
- 2 = Top view of connection base



Continued on L17/L18

L15

No maximum engine power
Porsche 928 S



L16

No maximum engine power
Porsche 928 S



Maximum engine power/top speed not reached (continued)

yes

Hot-wire air-mass sensor
mechanically and elec-
trically O.K.?

- Hot wire not broken?
- Resistance values within tolerance?
Between term. 6 and term. 3:
 $0...1100\ \Omega$
Between term. 5 and term. 3:
 $3.6...4.1\ \Omega$

no

Removal

- Remove left-hand and right-hand air intake hoses.
 - Loosen rubber bands on air filter and lift off top part
 - Loosen hose from blow-off change-over valve to right-hand part of lower half of air filter housing.
 - Loosen 2 hexagon screws A/F 13 in bottom part of air filter housing.
 - Remove bottom part of housing with hot-wire air-mass sensor.
- Warning: Withdraw bottom part of air filter housing and hot-wire air-mass sensor slowly from the intake manifold fitting. Do not lose O-ring (in fitting) and O-ring (dust protection).

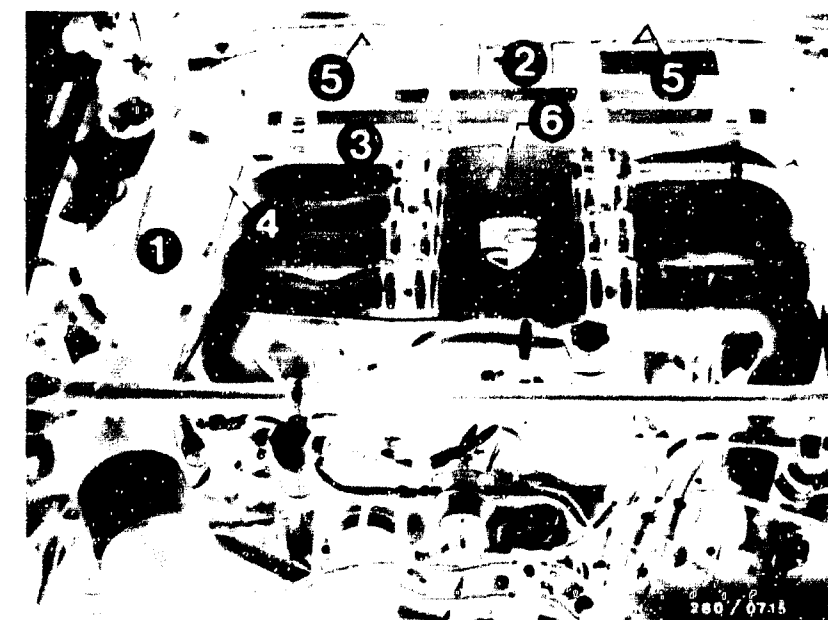
Visual examination

- Plug correctly connected.
- Spring retainer snapped in position. Plug not turned round. No pins pushed back or poor contact. Make sure that seal is correctly seated in plug.
- Wire screen O.K. on both sides?
If hot wire broken - replace hot-wire air-mass sensor.

yes

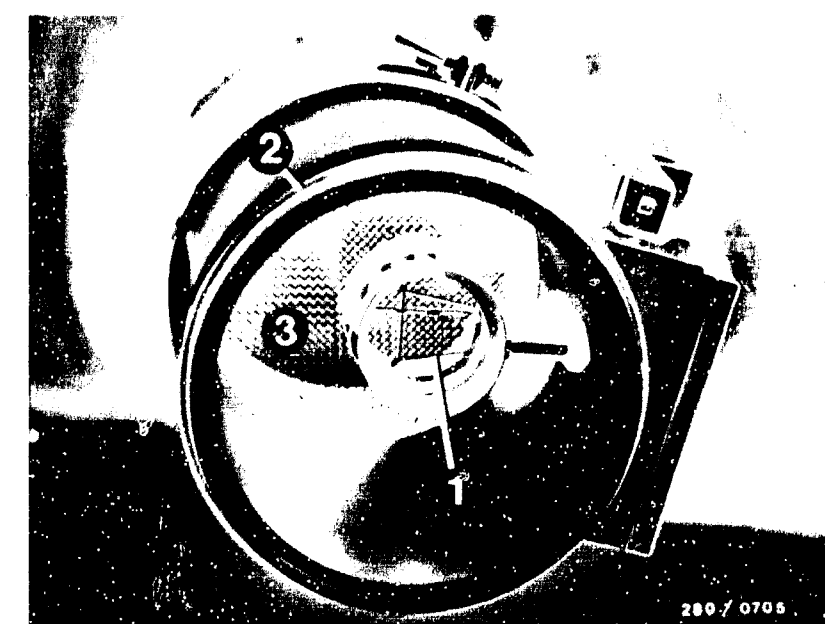
Continued on L21/L22

Continued on L19/L20



- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor

- 1 = Hot wire
- 2 = O-ring (dust protection)
- 3 = Wire screen



L17

No maximum engine power
Porsche 928 S



L18

No maximum engine power
Porsche 928 S



Maximum engine power/top speed not reached (continued)

yes

● Electrical test

- Disconnect plug. Set multimeter/motortester to Ω range.

Resistance measurement

between term. 6 and term. 3:

0...1100 Ω

between term. 5 and term. 3:

3.6...4.1 Ω

If incorrect, replace hot-wire air-mass sensor.

Installation

- Connect plug to hot-wire air-mass sensor (right way round).
- Lightly grease O-ring in fitting (use acid-free grease).
Ensure correct position of O-ring.
- Provide idle-mixture-adjusting screw with red plug 1 280 508 012.
- Carefully press bottom part of air filter housing with hot-wire air-mass sensor into intake manifold fitting. When mounting, pay attention to position and leak-tightness of O-ring and to accessibility of idle-mixture-adjusting screw when installed.
- Fasten bottom part of air filter housing with both hexagon screws (A/F 13).
- Re-fasten hose from blow-off change-over valve on bottom part of air filter housing.
- Assemble air filter and fasten with rubber bands.
- Correctly connect air intake hoses.



1 = Hot-wire air-mass sensor

3 = Plug

Press retainer in direction of arrow when disconnecting plug

1 = Intake hose

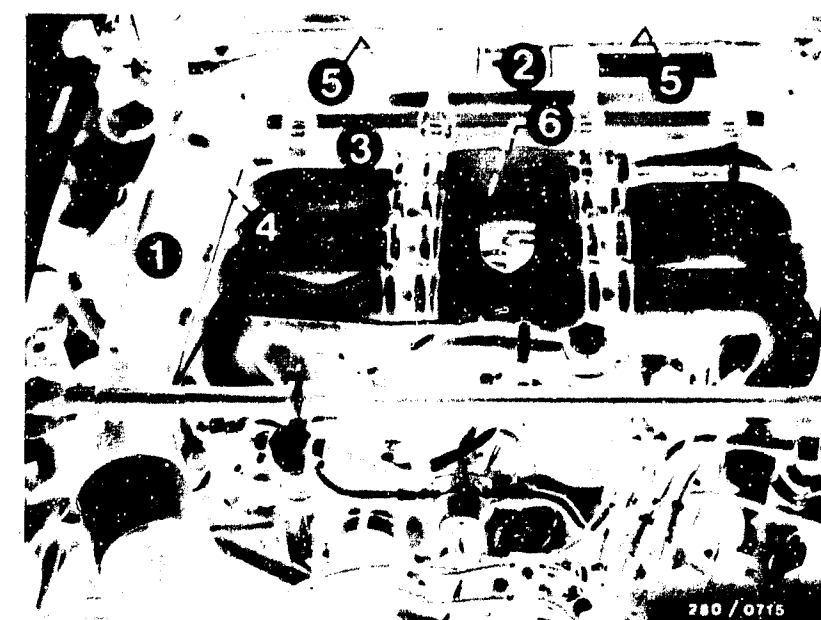
2 = Air-filter housing top part

3 = Air-filter housing bottom part

4 = Hose to blow-off change-over valve

5 = Hexagon screws

6 = Hot-wire air-mass sensor



Continued on L21/L22

L19

No maximum engine power

Porsche 928 S



L20

No maximum engine power

Porsche 928 S



Maximum engine power/top speed not reached (continued)

yes

Visual examination:
All hose lines correctly
connected, not kinked or
damaged?

- Air-intake system checked
for leaks with 0.3 bar
gauge pressure?

no

- Check whether hoses of air-intake system and
of fuel line system are correctly connected,
not kinked or damaged. If necessary, replace
hoses. Eliminate leaks by means of new seals
or by re-tightening the connecting screws.

Leak test

• Preparations

- Remove left-hand and right-hand air intake
hoses.
- Loosen rubber bands on air filter and lift
off top part of air filter.
- Loosen hose from blow-off change-over valve
to right-hand part of lower half of air filter
housing.
- Loosen 2 hexagon screws A/F 13 in bottom part
of air-filter housing.
- Remove bottom part of housing with hot-wire
air-mass sensor.

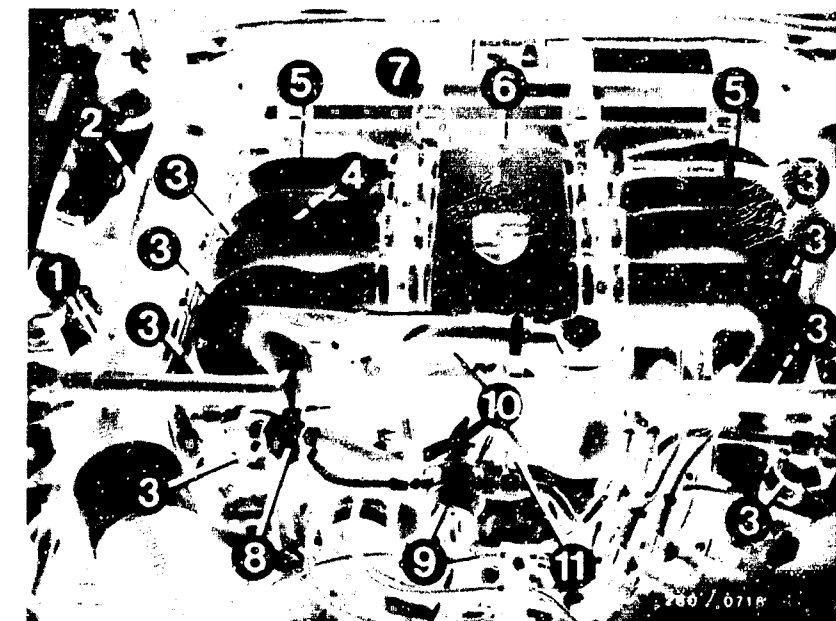
Warning: Withdraw bottom part of air filter
housing and hot-wire air-mass sensor slowly
from the intake manifold fitting. Do not
lose O-ring in fitting and O-ring (dust pro-
tection on hot-wire air-mass sensor).

- Loosen hot-wire air-mass sensor from bottom
part of air filter housing and seal the air
inlet opening e.g. with dust-protection
cover of pack).
- Re-mount bottom part of air filter housing
on hot-wire air-mass sensor.
- Disconnect both hoses from auxiliary-air
device and seal off tight the hose to the in-
take manifold.
- Mount bottom part of air filter housing with
the 2 hexagon screws A/F 13.

yes

Continued on L23/L24

Continued on L23/L24



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

L21

No maximum engine power
Porsche 928 S



L22

No maximum engine power
Porsche 928 S



Maximum engine power/top speed not reached (continued)

yes

- Testing
 - Blow air (0.3 bar gauge pressure) into the intake manifold with compressed-air gun.
 - Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Leaks may also occur at the following points on the engine:
 - Oil dipstick not securely inserted.
 - Defective cap seal on oil filler neck.
 - O-ring in intake manifold fitting leaking etc.
 - Bubbling or foaming indicates a leak.
- Installation
 - Install in the reverse sequence to removal.
 - Lightly grease O-ring in intake manifold fitting (acid-free grease). Remove dust-protection cover.
 - Re-establish the original condition.

Trouble-shooting program completed for customer complaint

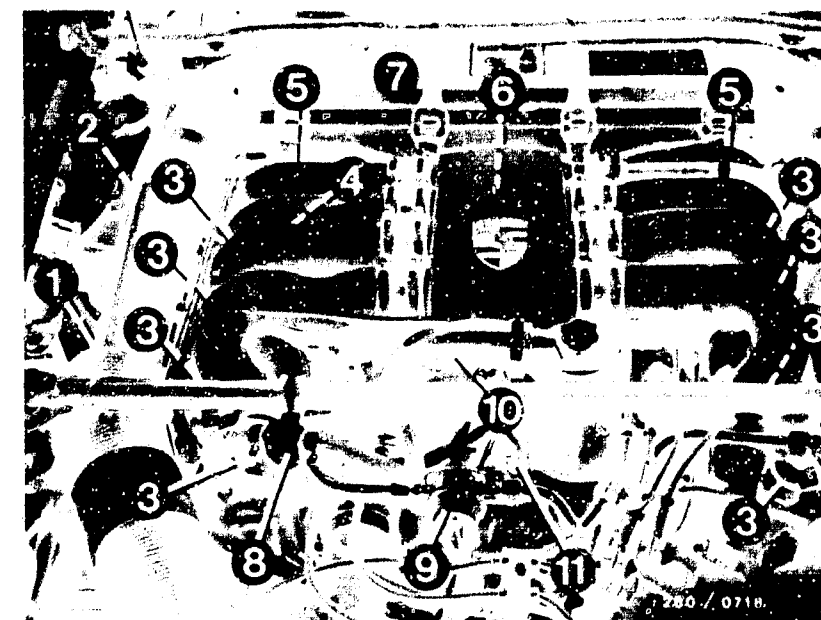
"Maximum engine power/top speed not reached".

Fault eliminated?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If the fault has not been detected with the "direct trouble-shooting chart", see "detailed trouble-shooting chart" (Coordinates C3...C4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

L23

No maximum engine power
Porsche 928 S



L24

No maximum engine power
Porsche 928 S



IDLE SPEED AND CO CONCENTRATION TOO LOW OR TOO HIGH

Trouble-shooting program according to customer complaint

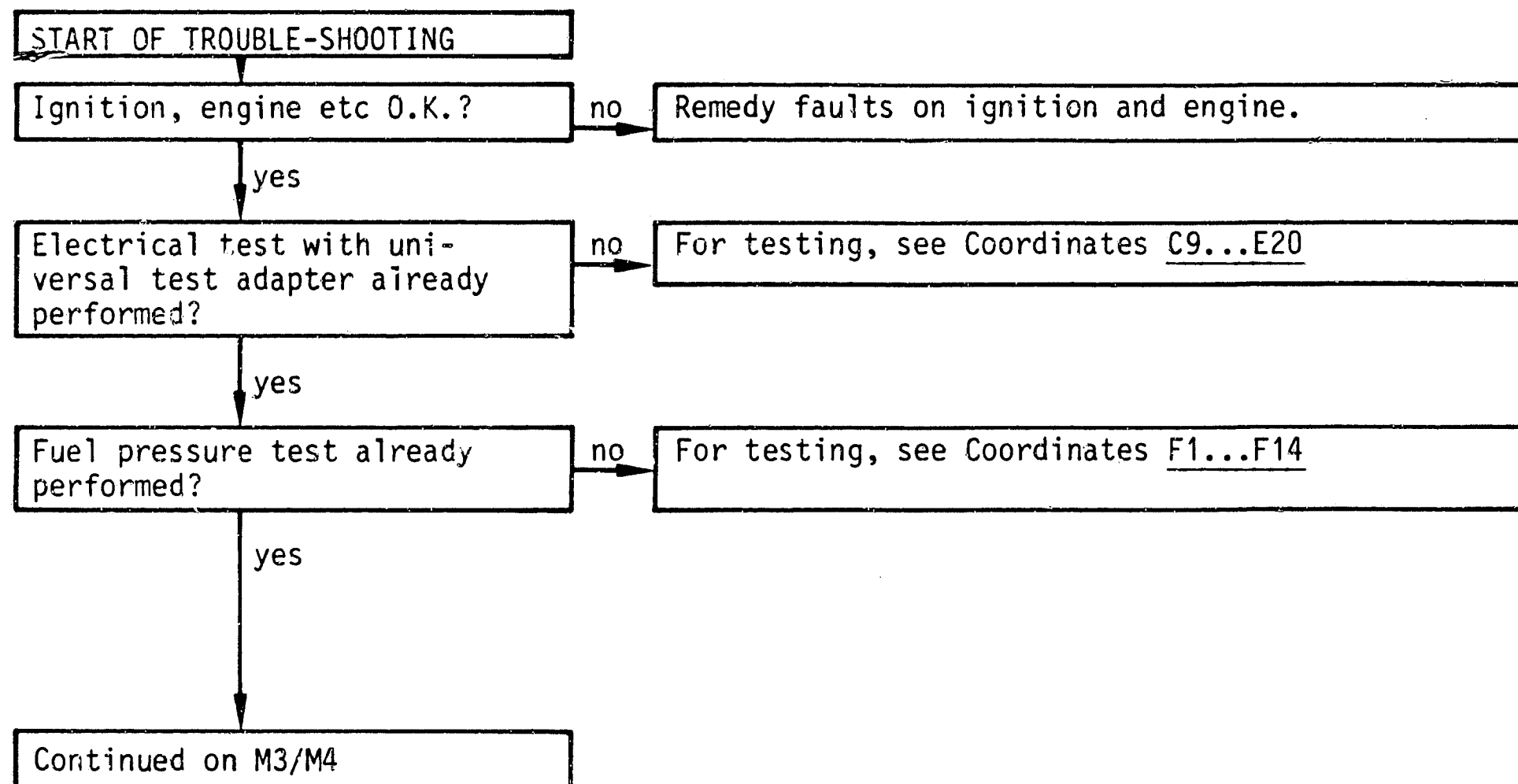
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row contains the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After the test has been completed, continue trouble-shooting at the point at which you branched off.



M1

Idle speed and CO adjustment
Porsche 928 S



M2

Idle speed and CO adjustment
Porsche 928 S



Idle speed and CO concentration too low or too high (continued)

yes

Idle speed:
700...750 min⁻¹
CO concentration
(with engine at normal
operating temperature).
0.5...1.5 vol. % CO
(Australia, Sweden,
Switzerland version
0.5...1.0 vol. %CO)

(CO adjustment with second-
ary-air injection dis-
connected).

Idle speed and CO concen-
tration correctly ad-
justed?

no

Idle speed and CO adjustment

• Idle speed (adjusting)

Requirement: The adjusting operations must
be performed as quickly as possible so that
the intake passages do not heat up, thereby
falsifying the CO reading.

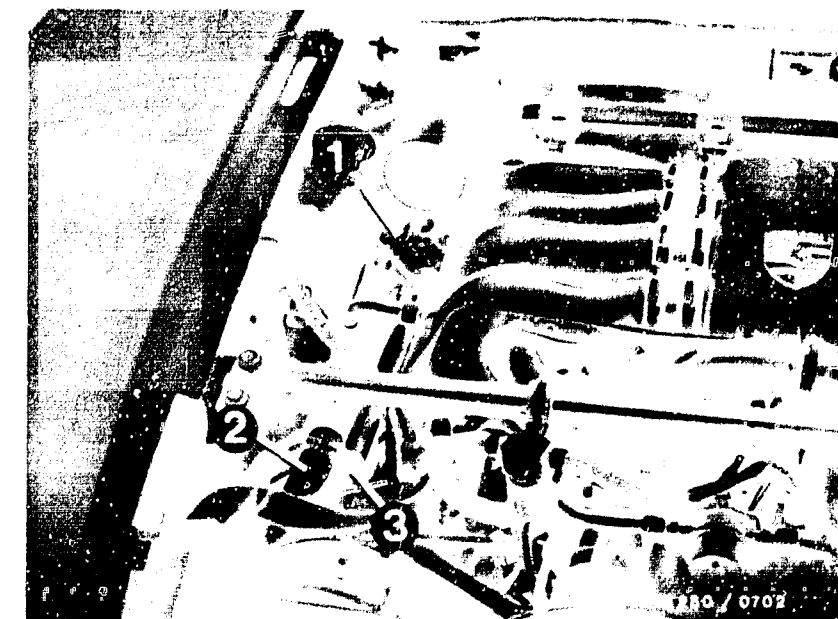
- Take off right-hand air intake hose.
- Pull off hose to air pump.
- Seal off pipe to blow-off change-over
valve (e.g. rubber sleeve from the door
Porsche Part No. 999. 703. 163. 40).
- Re-mount right-hand air intake hose.
- Bring engine to normal operating temperature.
- Connect motortester and exhaust-gas analyzer.
- Turn idle-air screw on throttle-valve
assembly until checking and setting value:
700...750 min⁻¹
is obtained.

Caution: Idle speed must not drop below
700 min⁻¹ since otherwise the ignition timing
is changed.

yes

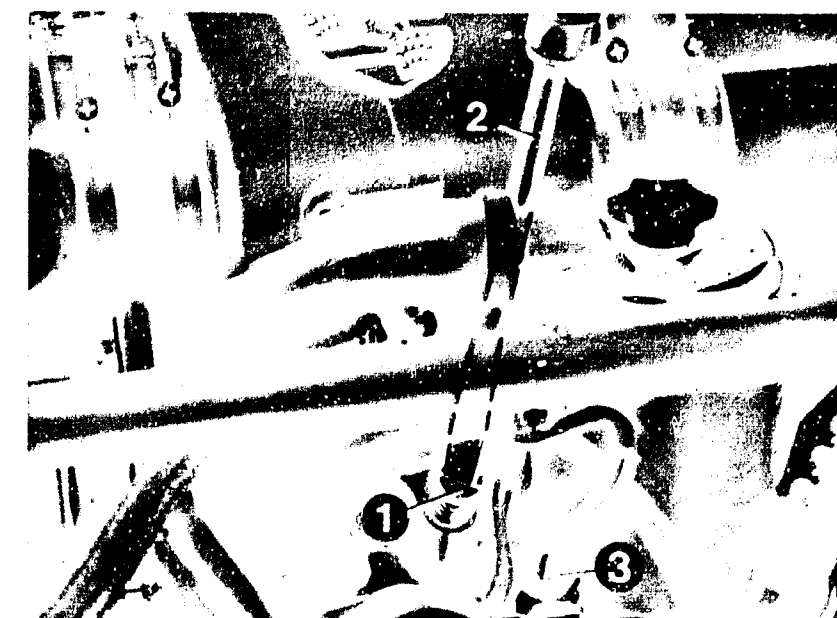
Continued on M7/M8

Continued on M5/M6



- 1 = Blow-off change-over valve
2 = Hose to air pump
3 = Rubber sleeve

- 1 = Idle air screw for engine-speed
adjustment
2 = Screwdriver
3 = Temperature sensor (double NTC)



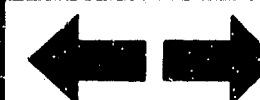
M3

Idle speed and CO adjustment
Porsche 928 S



M4

Idle speed and CO adjustment
Porsche 928 S



Idle speed and CO concentration too low or too high (continued)

• CO concentration

Adjusting:

Introduce special Porsche tool 9187 into the hexagon-socket-head cap screw A/F 3 of the air-mass sensor and turn the potentiometer appropriately for the idle mixture adjustment.

- Switch off exhaust extractor while measuring.

Observe safety regulations:

Checking and setting value:

0.5...1.5 vol. % CO

(Australia, Sweden, Switzerland version:

0.5...1.0 vol. % CO)

The Porsche 928 S is equipped as of 8.83 with secondary-air injection. Therefore, the above-explained procedure must be adopted for adjusting the idle speed and the CO concentration.

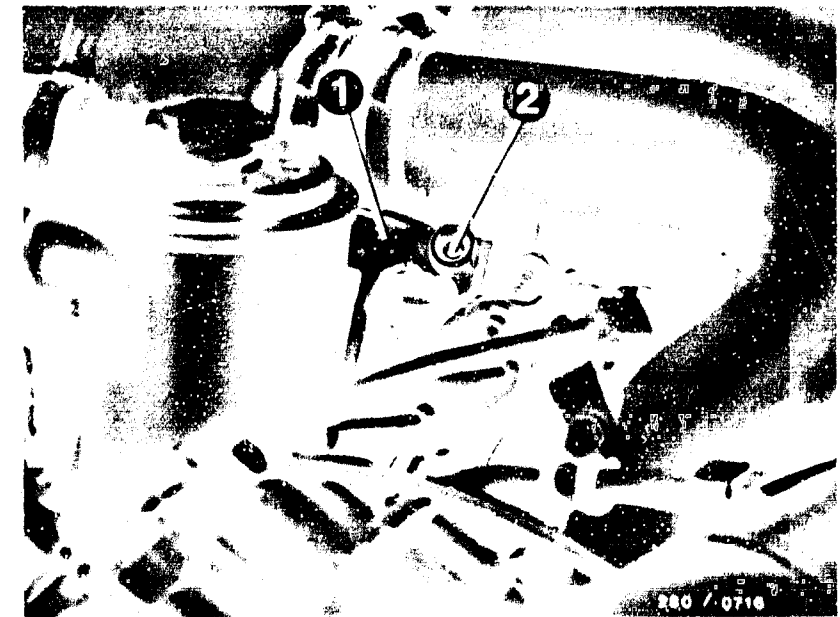
For all vehicles:

If CO concentration too high, turn CO adjusting screw in hot-wire air-mass sensor half a turn in a counterclockwise direction (hexagon-socket-head cap screw A/F 3 mm). Check idle speed and CO concentration again. If necessary, make corrections in several steps. After adjusting, use new, red plug (1 280 508 012).

Caution: Remove plug from air line and connect hose. Re-connect air intake hose if previously disconnected.

yes

Continued on M7/M8



1 = Hot-wire air-mass sensor

2 = Mixture-adjusting screw

1 = Non-return valve

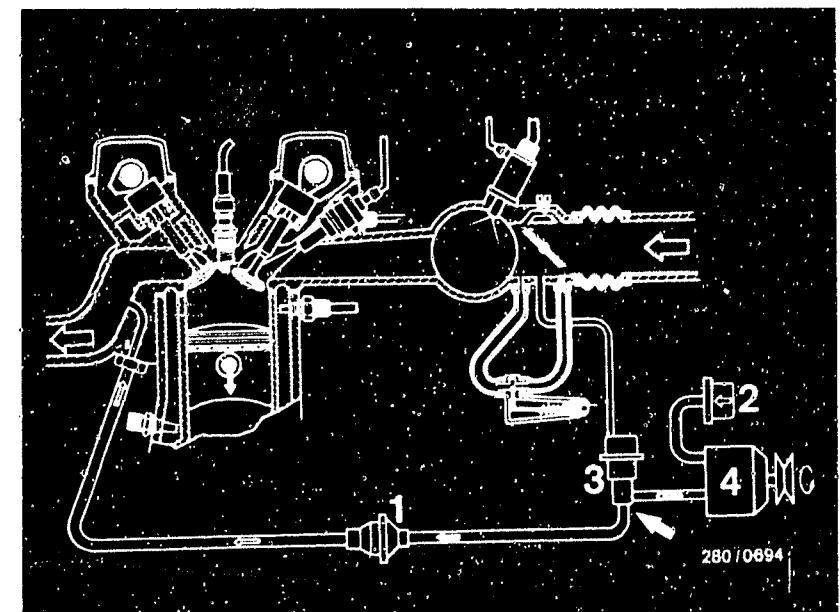
2 = Air filter for air pump

3 = Blow-off change-over valve

4 = Air pump

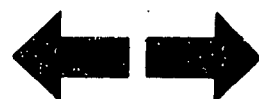
Arrow = Seal outlet.

On the 928 S, seal air line from air pump to blow-off change-over valve.



M5

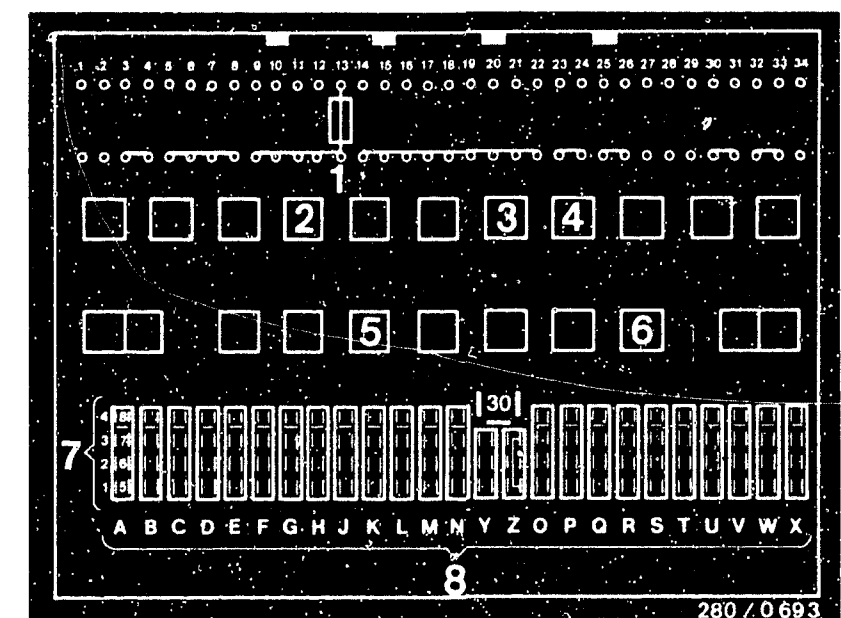
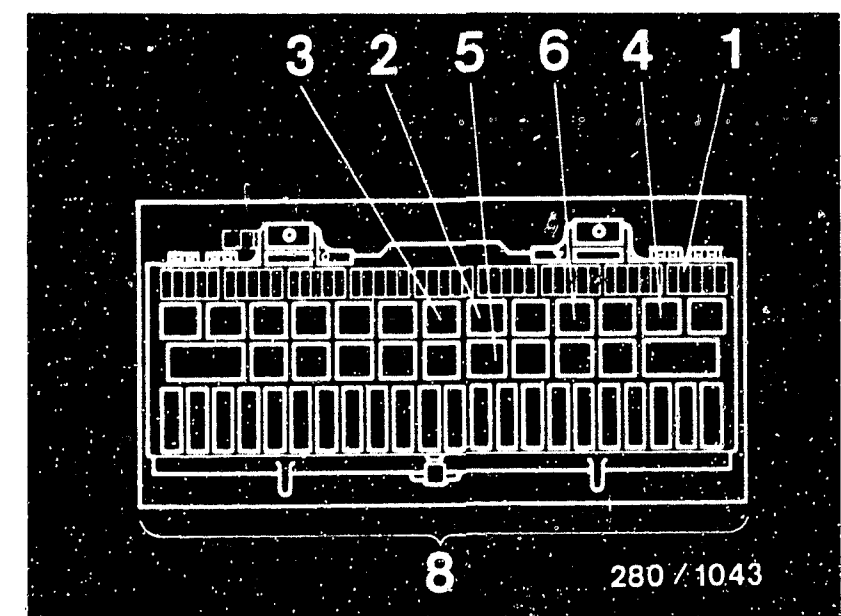
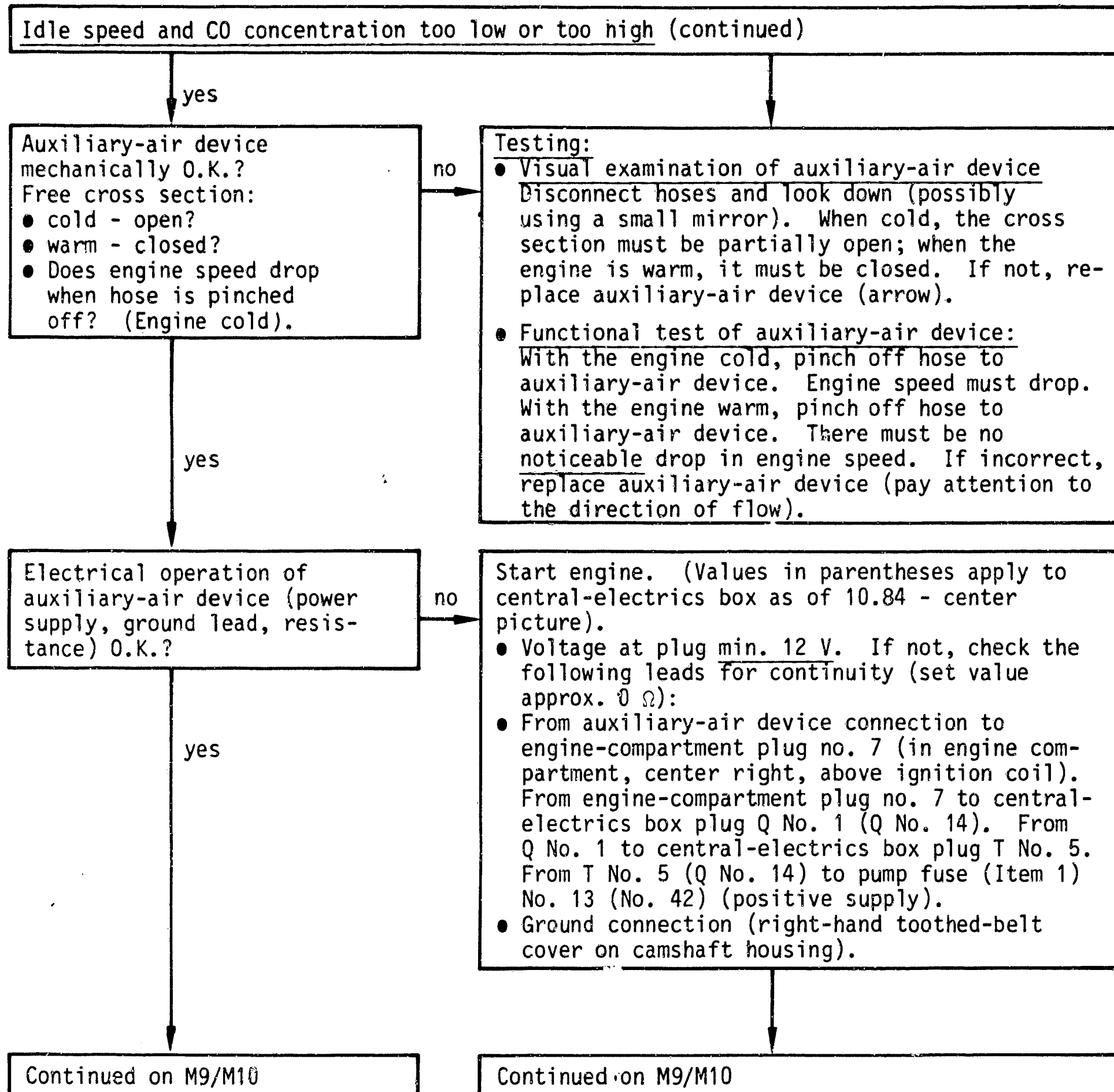
Idle and CO adjustment
Porsche 928 S



M6

Idle and CO adjustment
Porsche 928 S





M7

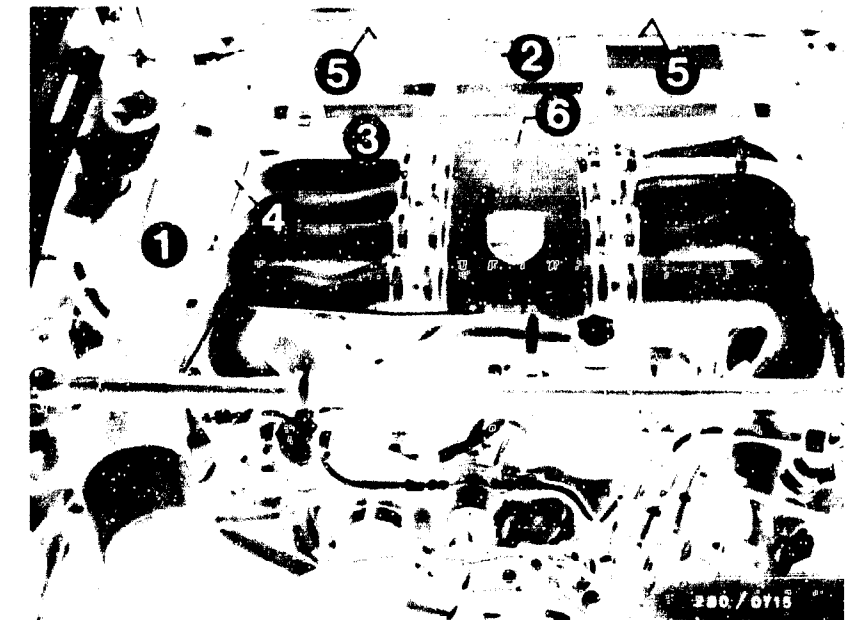
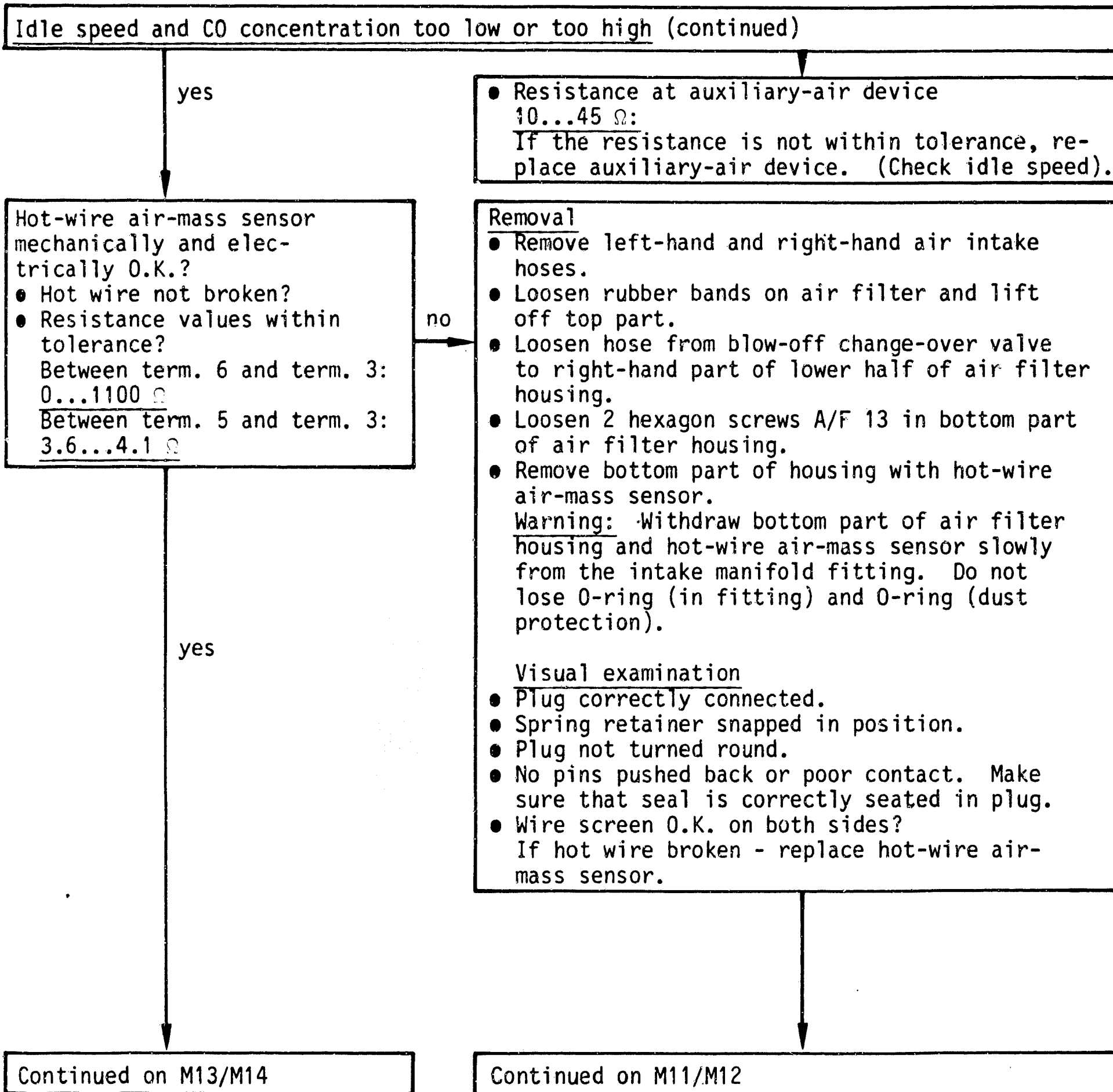
Idle speed and CO adjustment
Porsche 928 S



M8

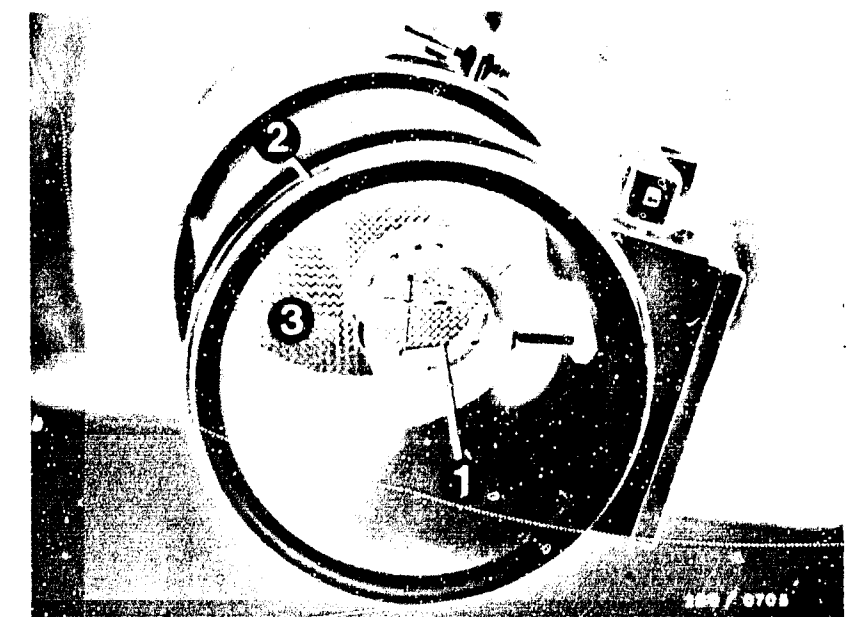
Idle speed and CO adjustment
Porsche 928 S





- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor

- 1 = Hot wire
- 2 = O-ring (dust protection)
- 3 = Wire screen



M9

Idle speed and CO adjustment
Porsche 928 S



M10

Idle speed and CO adjustment
Porsche 928 S

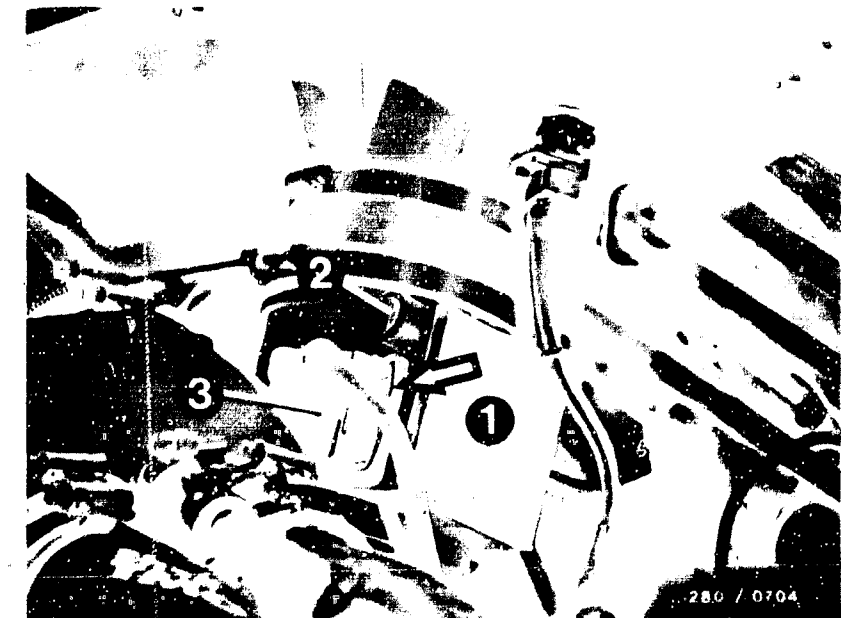


Idle speed and CO concentration too low or too high (continued)

yes

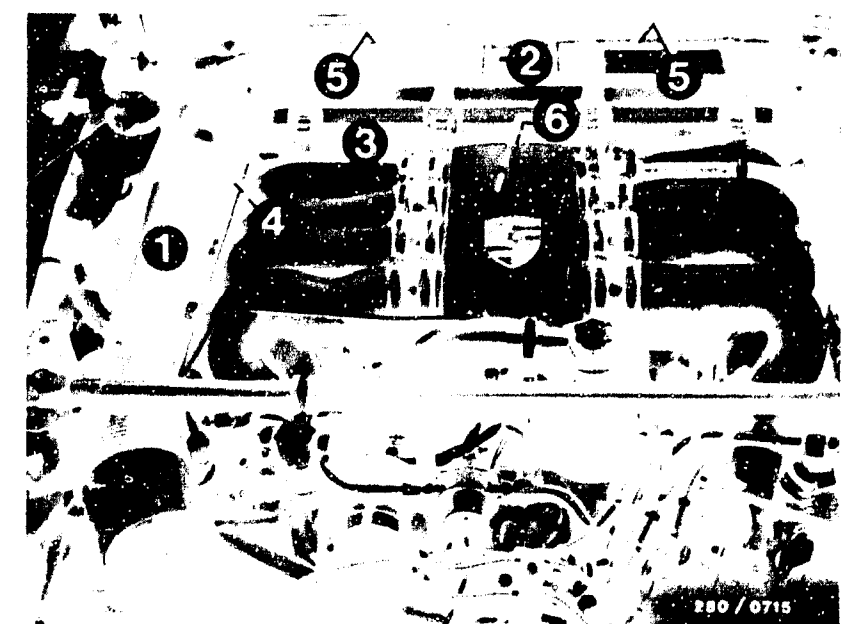
- Electrical test
 - Disconnect plug. Set multimeter/motortester to Ω range.
 - Resistance measurement
 - between term. 6 and term. 3:
0...1100 Ω
 - between term. 5 and term. 3:
3.6...4.1 Ω
 - If incorrect, replace hot-wire air-mass sensor.
- Installation
 - Connect plug to hot-wire air-mass sensor (right way round).
 - Lightly grease O-ring in fitting (use acid-free grease).
 - Ensure correct position of O-ring.
 - Provide idle-mixture-adjusting screw with red plug 1 280 508 012.
 - Carefully press bottom part of air filter housing with hot-wire air-mass sensor into intake manifold fitting. When mounting, pay attention to position and leak-tightness of O-ring and to accessibility of idle-mixture-adjusting screw when installed.
 - Fasten bottom part of air filter housing with both hexagon screws (A/F 13).
 - Re-fasten hose from blow-off change-over valve on bottom part of air filter housing.
 - Assemble air filter and fasten with rubber bands.
 - Correctly connect air intake hoses.

Continued on M13/M14



- 1 = Hot-wire air-mass sensor
- 3 = Plug
- Press retainer in direction of arrow when disconnecting plug

- 1 = Intake hose
- 2 = Air-filter housing top part
- 3 = Air-filter housing bottom part
- 4 = Hose to blow-off change-over valve
- 5 = Hexagon screws
- 6 = Hot-wire air-mass sensor



M11

Idle speed and CO adjustment
Porsche 928 S



M12

Idle speed and CO adjustment
Porsche 928 S



Idle speed and CO concentration too low or too high (continued)

CO reading less than test specification

1.5 vol. % CO?

(Australia, Sweden, Switzerland version:

Test specification:

1.0 vol. % CO?)

Cold start control O.K.?

(Control unit function)

- Remove pump fuse (1) and unplug 2-pin plug-in connection above central-electrics box.
- Connect test lead between an injection valve.
- Disconnect plug from engine temperature sensor II (double NTC). Colour of plug blue.
- Connect motortester/multimeter to test lead. (Setting V, measuring range 10 V). Start engine. Voltage at injection valve must drop during starting from approx. 7 V to approx. 0.5 V (with engine at normal op. temp. or with NTC II plug connected, the voltage is less than 0.5 V). After testing, re-establish the original condition.

yes

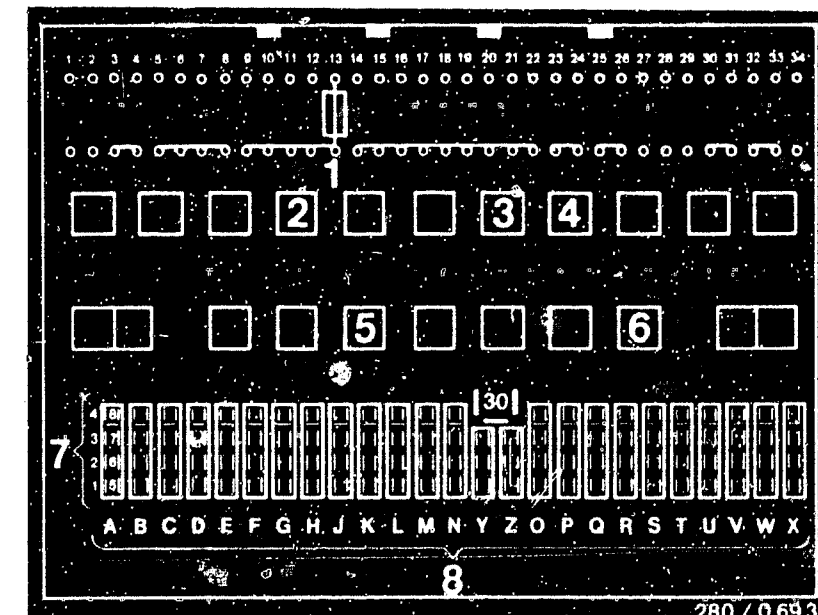
Continued on M19/M20

Functional test:

- Hinge up running plate (front passenger footwell cover plate behind the floor mat).
- Remove pump fuse (1) up to 9.84: No. 13 as of 10.84: No. 42
- Unplug 2-pin plug-in connection above the central-electrics box. (Green and white shielded connecting leads).

no

Continued on M15/M16

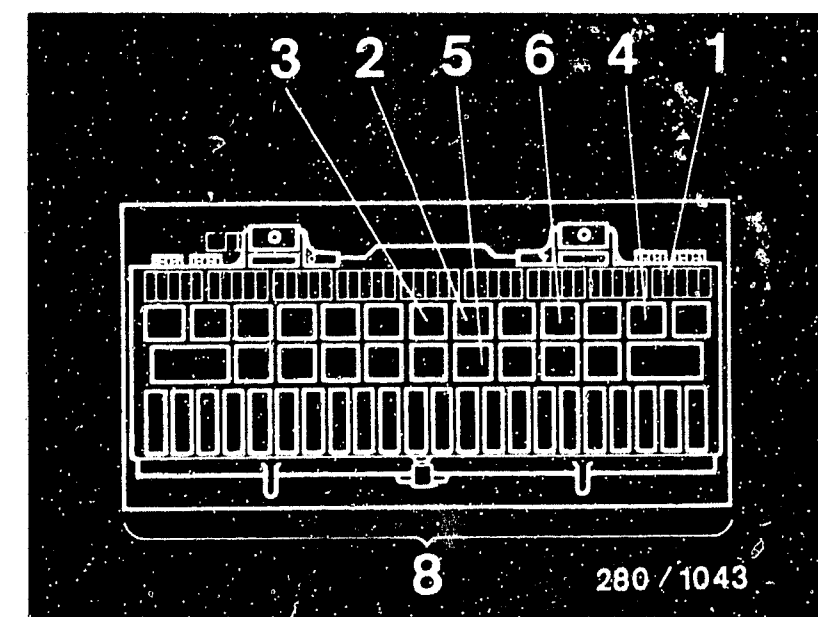


Central-electrics box up to 9.84:

1 = Pump fuse (No. 13)

Central-electrics box as of 10.84:

1 = Pump fuse



M13

Idle speed and CO adjustment
Porsche 928 S



M14

Idle speed and CO adjustment
Porsche 928 S



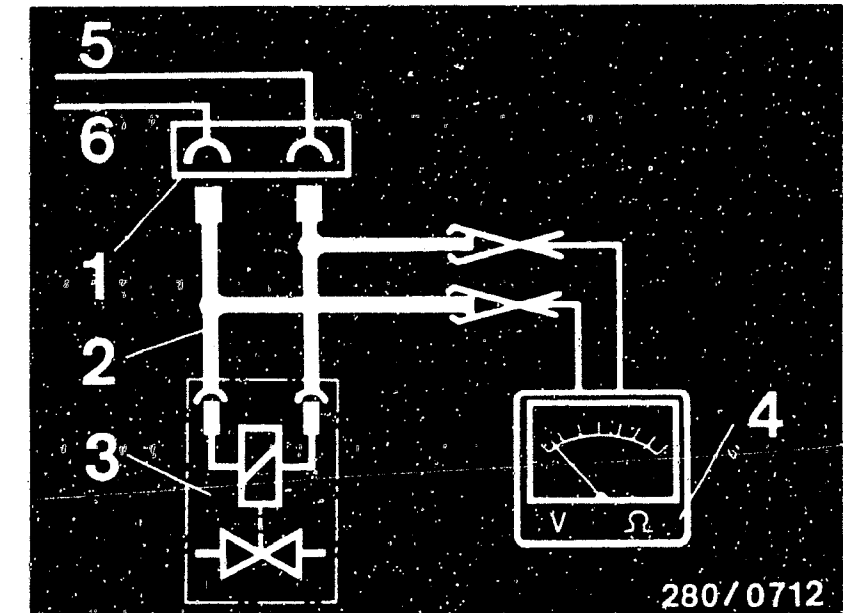
Idle speed and CO concentration too low or too high (continued)

yes

- Connect test lead 1 684 463 093.
Connect 2-pole test lead 1 684 463 093 between an injection valve and its electrical connecting lead.
- Connect multimeter to unoccupied measuring poles. Measuring range approx. 10 V.
- Disconnect plug from temperature sensor II (engine).
(Double NTC, colour of plug blue). Engine must not start while the starting motor is operated.
- Measuring:
 - Crank engine.
 - Voltage reading drops from initially approx. 4 V within approx. 15 s cranking time to approx. 0.5 V. If voltage readings not obtained, replace control unit.
 - Wait approx. 1 minute before repeating test.
 - Connect plug to temperature sensor. If engine at normal operating temperature, start. Voltage reading less than 0.5 V. If voltage reading not as stated, replace temperature sensor II (double NTC).

Caution:
After testing, re-establish the original condition.

Continued on M19/M20



- 1 = Connector of injection valve lead
 - 2 = Test lead 1 684 463 093
 - 3 = Injection valve
 - 4 = Multimeter/motortester
 - 5 = From central-electrics box plug X No. 2 (W No. 13)
 - 6 = From control unit term. 13
-
- 1 = Temperature sensor II (engine)



M15

Idle speed and CO adjustment
Porsche 928 S



M16

Idle speed and CO adjustment
Porsche 928 S



Idle speed and CO concentration too low or too high (continued)

yes

- Leak test on injection valves
- Remove fuel-distribution pipes with injection valves:

Loosen fastening screws on fuel-distribution pipe and injection valves.
Withdraw all 8 injection valves simultaneously and carefully from the cylinder head.
Build up fuel pressure:
Jump safety circuit.

Caution:

Make sure that no fuel gets onto hot parts of the engine.

Test specification:

Within 60 seconds no drop may fall from the mouth of the injection valve.

If incorrect, replace injection valve.

- Removal:

- Disconnect electrical connection.
- Break open hose-termination sleeve on fuel-distribution pipe.
- Cut open hose in longitudinal direction with soldering iron and pull off injection valve.

Caution: Catch escaping fuel. Do not allow to drip onto hot parts of the engine.

Warning:

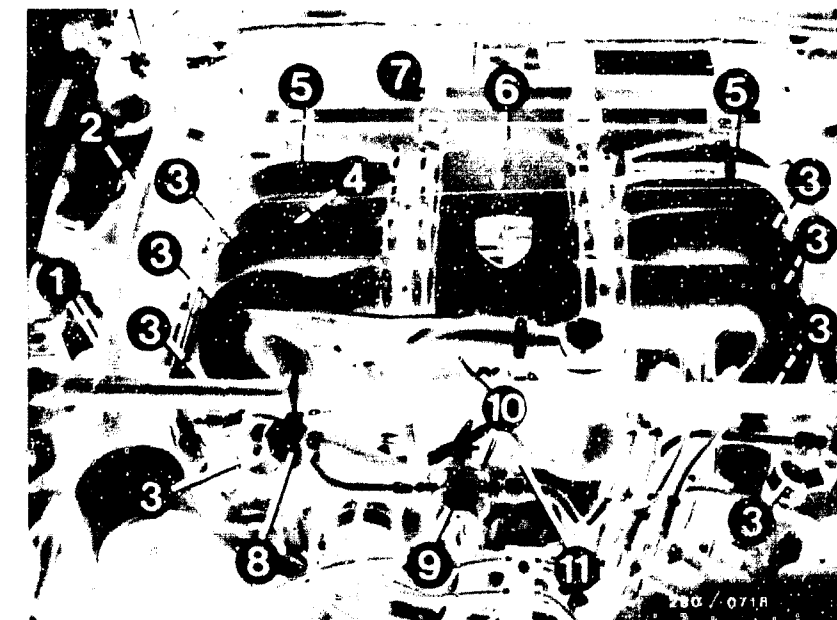
Before installing, the rubber seals at the valve mouth sleeve may be greased only lightly (silicone grease Ft 2 v 1). The other parts of the injection valves must remain grease-free.

- Installation

- Plug on hose-termination sleeve (fuel-distribution pipe).
- Plug on injection valve (make sure there are no leaks).

Caution: After testing, re-establish the original condition of the injection valves and fuel-distribution pipes. Check for leaks (unmetered air).

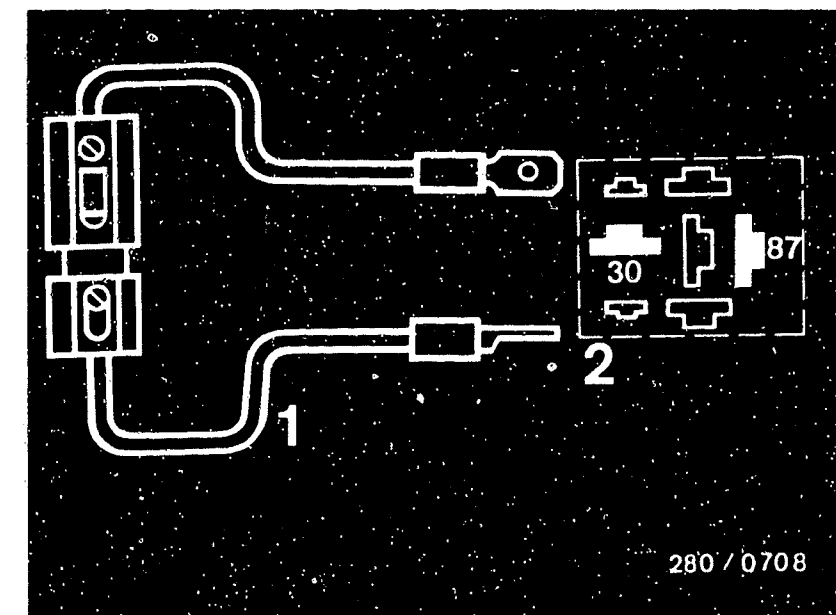
Continued on M19/M20



3 = Injection valves

1 = Jumper with fuse holder and 10 A fuse (user-fabricated)

2 = Top view of connection base



M17

Idle speed and CO adjustment

Porsche 928 S



M18

Idle speed and CO adjustment

Porsche 928 S



Idle speed and CO concentration too low or too high (continued)

yes

CO reading greater than
test specification?

Europe: 0.5 vol. % CO

Australia, Sweden,
Switzerland: 0.5 vol. % CO

- Air-intake system
checked for leaks with
0.3 bar gauge
pressure?

no

Leak test

• Preparations

- Remove left-hand and right-hand air intake hoses.
- Loosen rubber bands on air filter and lift off top part of air filter.
- Loosen hose from blow-off change-over valve to right-hand part of lower half of air filter housing.

- Loosen 2 hexagon screws A/F 13 in bottom part of air-filter housing.

- Remove bottom part of housing with hot-wire air-mass sensor.

Warning: Withdraw bottom part of air filter housing and hot-wire air-mass sensor slowly from the intake manifold fitting. Do not lose O-ring in fitting and O-ring (dust protection on hot-wire air-mass sensor).

- Loosen hot-wire air-mass sensor from bottom part of air filter housing and seal the air inlet opening e.g. with dust-protection cover of pack).

- Re-mount bottom part of air filter housing on hot-wire air-mass sensor.

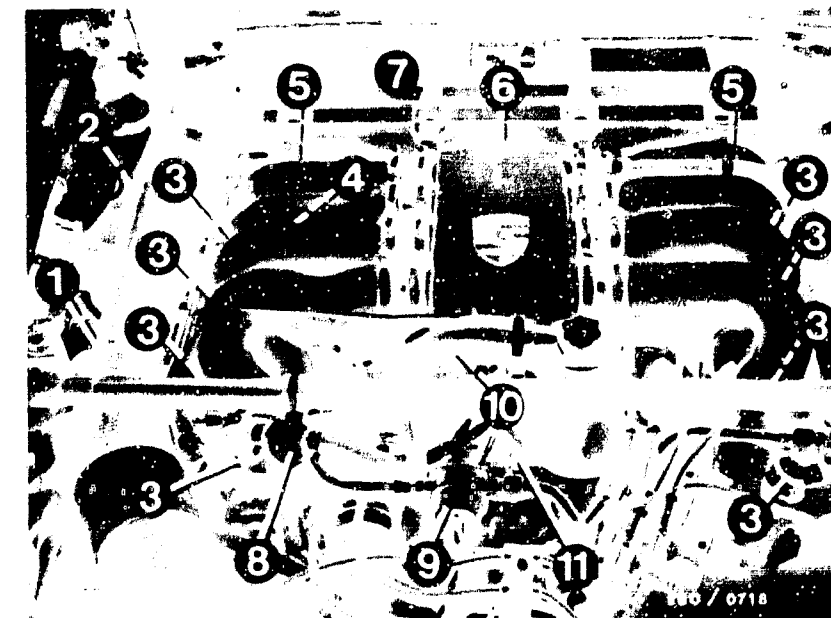
- Disconnect both hoses from auxiliary-air device and seal off tight the hose to the intake manifold.

- Mount bottom part of air filter housing with the 2 hexagon screws A/F 13.

yes

Continued on M21/M22

Continued on M21/M22



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

M19

Idle speed and CO adjustment

Porsche 928 S



M20

Idle speed and CO adjustment

Porsche 928 S



Idle speed and CO concentration too low or too high (continued)

yes

- Testing
 - Blow air (0.3 bar gauge pressure) into the intake manifold with compressed-air gun.
 - Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Leaks may also occur at the following points on the engine:
 - Oil dipstick not securely inserted.
 - Defective cap seal on oil filler neck.
 - O-ring in intake manifold fitting leaking etc.
 - Bubbling or foaming indicates a leak.
- Installation

Install in the reverse sequence to removal. Lightly grease O-ring in intake manifold fitting (acid-free grease). Remove dust-protection cover. Re-establish the original condition.

Trouble-shooting program completed for customer complaint

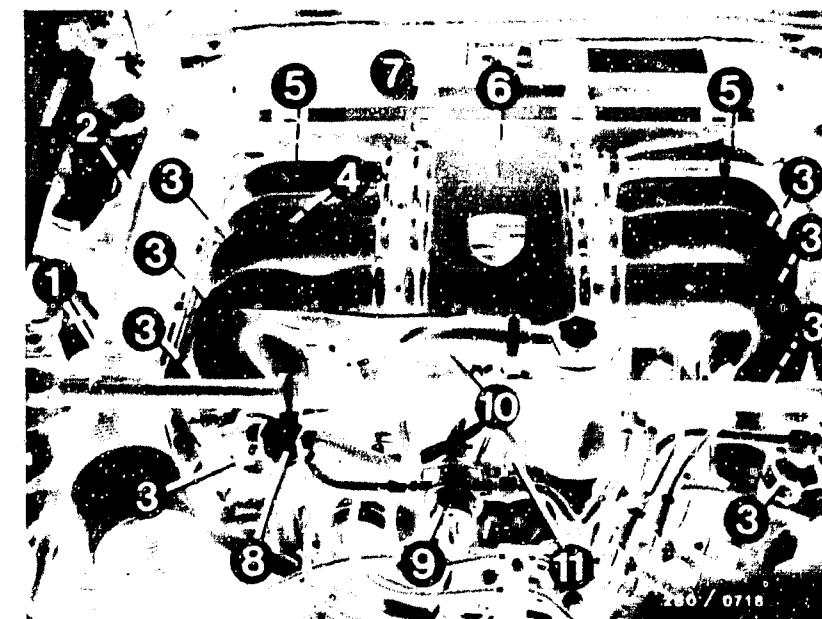
"Idle speed and CO concentration too low or too high".

Fault eliminated?

no

Further possibilities

- Customer complaint incorrectly diagnosed (see Coordinates C3...C8). If the fault has not been detected with the "direct trouble-shooting chart", see "detailed trouble-shooting chart" (Coordinates C3...C4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



- 1 = Output stage ground terminal
- 2 = Electronics ground terminal
- 3 = Injection valves
- 4 = Auxiliary-air device
- 5 = Pressure regulator
- 6 = Hot-wire air-mass sensor
- 7 = Air filter
- 8 = Solenoid-operated air valve
- 9 = Pressure damper
- 10 = Throttle-valve switch
- 11 = Temperature sensor II

M21

Idle speed and CO adjustment
Porsche 928 S



M22

Idle speed and CO adjustment
Porsche 928 S



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28

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 464 ..

VDT-I-280/107 En

9.1984

(Supersedes Ed. 3.1983)

Electric fuel pump	Parts set (non-ret. valve and seal ring)	Non-return valve	Seal
0 580 364 002	---	1 583 386 011	1 580 203 001
0 580 464 005	---	008	001
006	---	008	001
007	---	008	001
009	---	008	001
010	---	008	001
017	1 587 010 002		
018	007		
021	006		
022	007		
024	006		
025	007		
027	006		
028	006		
029	1 587 010 506		
030	006		
031	005		
1 580 464 997	006		

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Technical Bulletin

Porsche 928 S



After-sales Service

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DETERMINATION OF THE TEMPERATURE VALUES
GIVEN IN L-JETRONIC MANUALS

VDT-I-280/108 En
5.1982

We have recently been asked with increasing regularity how accurately the engine temperature must be measured when trouble-shooting on the vehicle.

So far in its L-Jetronic manuals KH/VSK has given three or four different temperatures for testing the temperature sensor:

-10 °C, +20 °C, +40 °C and +80 °C,

and two ranges for the thermo-time switch e.g. 35 °C 8 sec.

below +30 °C and above +40 °C.

Since the temperature range need not be subject to such close tolerances, we propose in future the following more appropriate definition:

- Ambient temperature (approx. +15 °C to +30 °C)
- Engine at normal operating temperature (approx. +80 °C).

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N2

Technical Bulletin

Porsche 928 S



After-sales Service

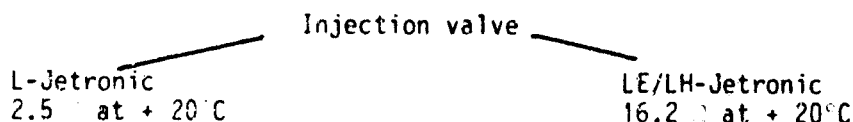
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CODING OF LE/LH-JETRONIC
SOLENOID-OPERATED INJECTION VALVES

VDT-I-280/109 En
5.1982

With the introduction of the LE/LH-Jetronic the internal resistance of the solenoid-operated injection valves has also been changed.



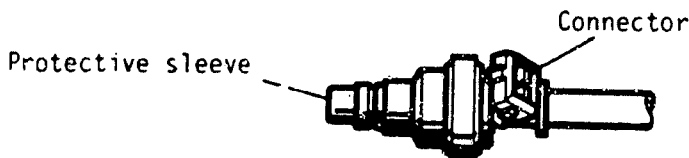
The connector has been left the same for cost reasons and to meet customer wishes.

Caution!

If L-Jetronic injection valves are installed in an LE/LH-Jetronic vehicle, either the control unit or the injection valves will suffer irreparable damage.

Note:

- Install only injection valves with the part number designated for the vehicle.
- As a guide, injection valves with 16.2 Ω internal resistance have a yellow protective sleeve.



- A colour coding (yellow) of the connector (see also VDT-I-280/5) is not generally intended for LE/LH-Jetronic injection valves.

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28

PLUG CONNECTORS FOR
JETRONIC COMPONENTS
Parts sets

VDT-I-280/111 En

11.1984

(supersedes edition 11.1982)

Parts sets are available for replacement of Jetronic plug connectors. These consist of:

- Plug connector housing
- Protective cap (rubber sleeve)
- Contact springs

These parts are listed on microfiche EE...*.

* see microfiche EE00 under 0 280 ..

- Plug, black, 2-pin,
parts set 1 287 013 002 cable connector in conjunction with socket, 2-pin
- Socket, black, 2-pin,
parts set 1 287 013 001 for e.g.

Temperature sensor	0 280 130 0..
Auxiliary-air device	0 280 140 ..
Thermo-time switch	0 280 130 2..
Start valve	0 280 170 ..
Warm-up regulator	0 438 140 ..

- Socket, grey, 2-pin
parts set 1 287 013 003 for:

Solenoid-operated injection valve	0 280 150 ..
--------------------------------------	--------------

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Technical Bulletin

Porsche 928 S



- Socket, black, 3-pin,
parts set 1 237 000 039 for:
Throttle-valve switch 0 280 120 ..
- Socket, black, 5-pin,
parts set 1 287 013 006 for:
Air-flow sensor 0 280 20. ..
(LE version)
- Socket, black, 6-pin,
parts set 1 287 013 004 for
Air-flow sensor 0 280 200 ..
- Socket, black, 7-pin,
parts set 1 287 013 005 for:
Air-flow sensor 0 280 20. ..
Air-mass sensor 0 280 211 ..
- Wiring-harness plug connector, black, 25-pin
parts set 1 287 013 009 for:
Control unit 0 280 0..
- Wiring-harness plug connector, black, 35-pin,
parts set 1 287 013 008 for:
Control unit 0 280 0..

The contact springs (minitimers) are also available separately under part no. 1 284 477 026.

The plug-connector housings are only available in the stated colours.

Responsible:

Robert Bosch GmbH

Division KH

Technical After-Sales Service (KH/VKD 2)

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28

L-JETRONIC

VDT-I-280/112 En

System version LH 2

8.1984

After-sales service procedure

supersedes Ed. 12.1983

Brief description of system

In contrast to the basic version of the L-Jetronic, the LH version measures the air mass instead of the air flow.

The signals are processed in the control unit using digital (and not analog) techniques. The operation of the other components is as in the L versions.

User

Porsche is equipping its 928 S model (Europe version) with the LH 2 version as of 8.83.

Components

Control unit	0 280 002 5..
Hot-wire air-mass sensor	0 280 214 0..

Further components as in L version vehicles.

The precise part numbers are listed on the respective vehicle microfiche AA .. .

N6

Technical Bulletin

Porsche 928 S



Service parts/exchange parts

The control unit will be available as an exchange part one year after the vehicle start-up date (see microfiches WB.. and PD 02).

Test concept

The system is tested in the vehicle using the universal test adapter in conjunction with a special adapter lead and a commercially available multimeter.
Special tools are not required.

Test equipment

Universal test adapter
ETT 018.01

Part No. 0 684 101 801

Adapter lead

Part No. 1 684 463 141

Supplied through usual channels (RG/AV).

Test equipment hire

The adapter lead can be hired for testing:

In countries outside Germany: From your RG/AV.

Technical documentation

Technical Bulletin "New Product" VDT-I-280/4 of 10.83 and VDT-I-280/7.

Trouble-shooting instructions and test specifications: SIS microfiche POR 504.



System training

Integrated in the L-Jetronic course.

Retrofitting

This system is not intended for retrofitting.

Warranty procedure

Components which are the subject of complaint should be sent in during the warranty period to your national representative for warranty assessment.

Published by:

Robert Bosch GmbH

Division KH

Technical After-Sales Service (KH/VKD 2)

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After-sales Service

Motor Vehicle Service Information

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EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system installed predominantly in export vehicles

	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	•	•	•	(•)	(•)
Secondary-air induction*	•	•	•	(•)	(•)
Secondary-air injection*	•	•	•	(•)	(•)
Catalytic converter*	-	-	-	•	•
Lambda closed-loop control	-	-	-	•	•

The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

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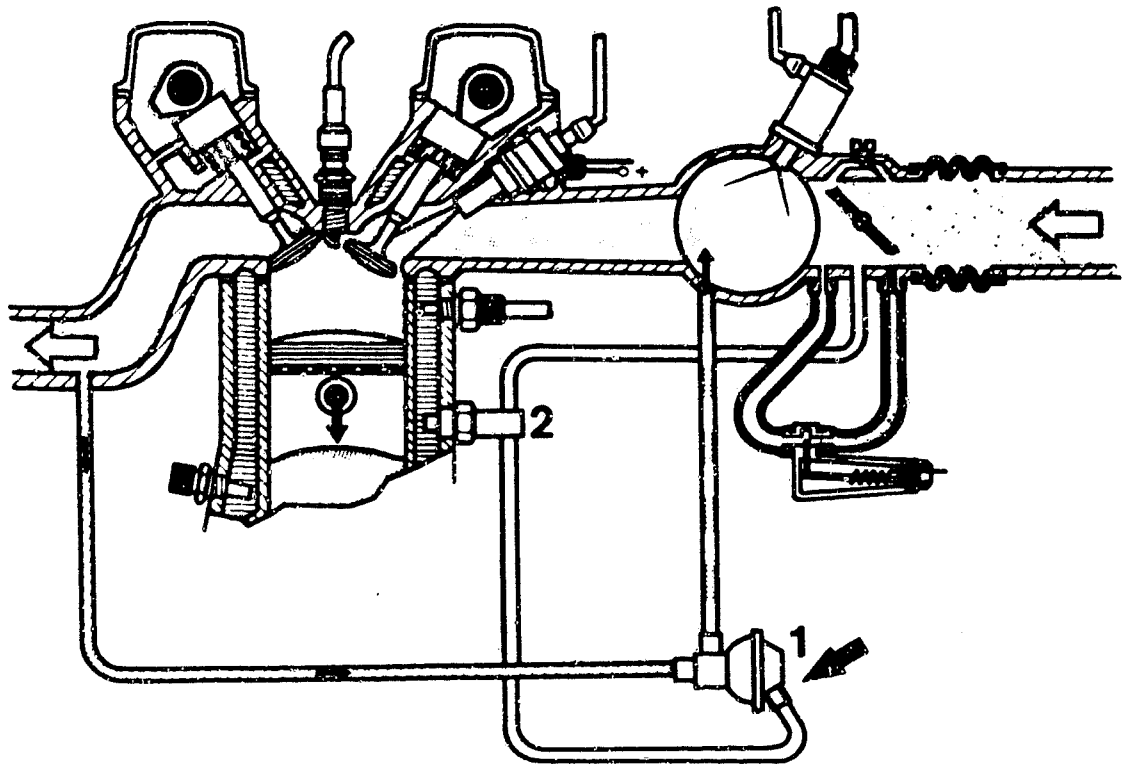
N9

Motor Vehicle Service Information

Porsche 928 S



1. Exhaust-gas recirculation (EGR)



1 = Exhaust-gas recirculation valve 2 = Thermo-valve

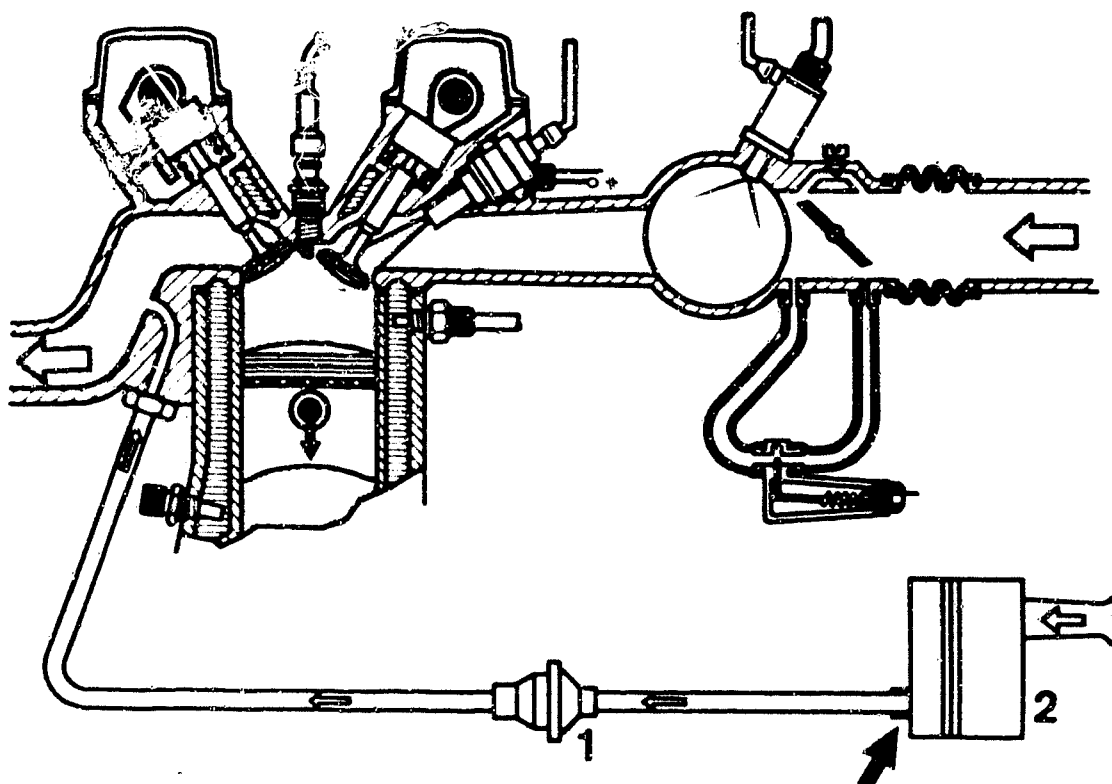
Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NO_x). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min⁻¹. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.



2. Secondary-air induction (e.g. Volvo Pulsair system)



1 = Non-return valve

2 = Air filter

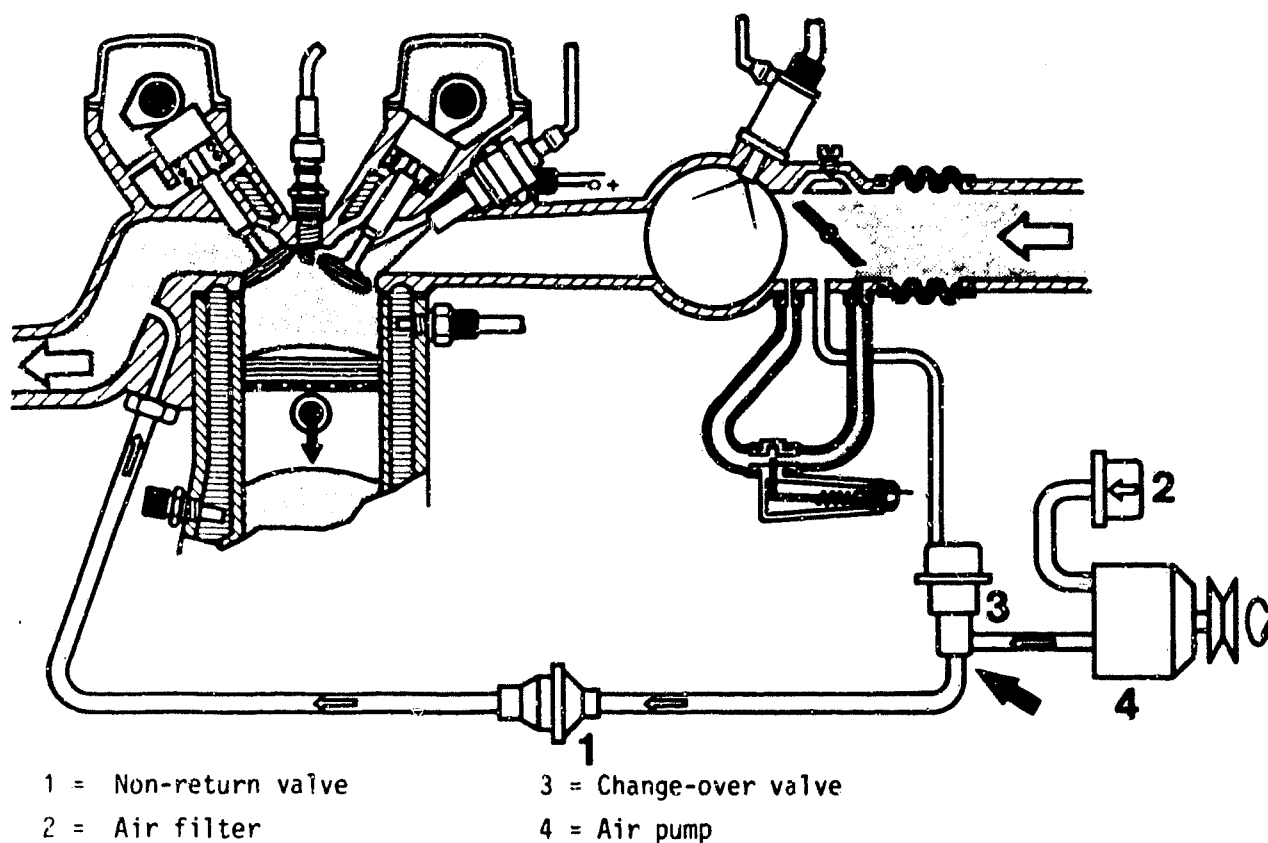
The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.



3. Secondary-air injection



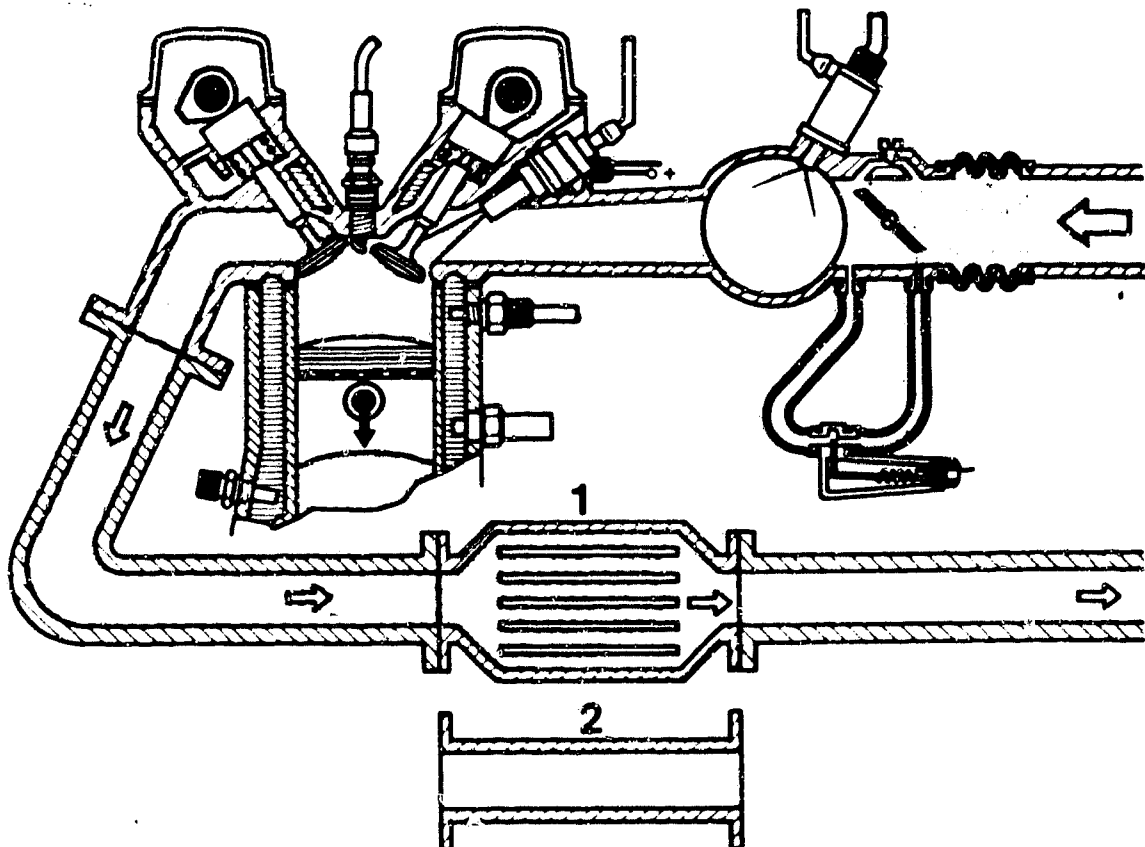
An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.



4. Catalytic converter



1 = Catalytic converter

2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.

Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

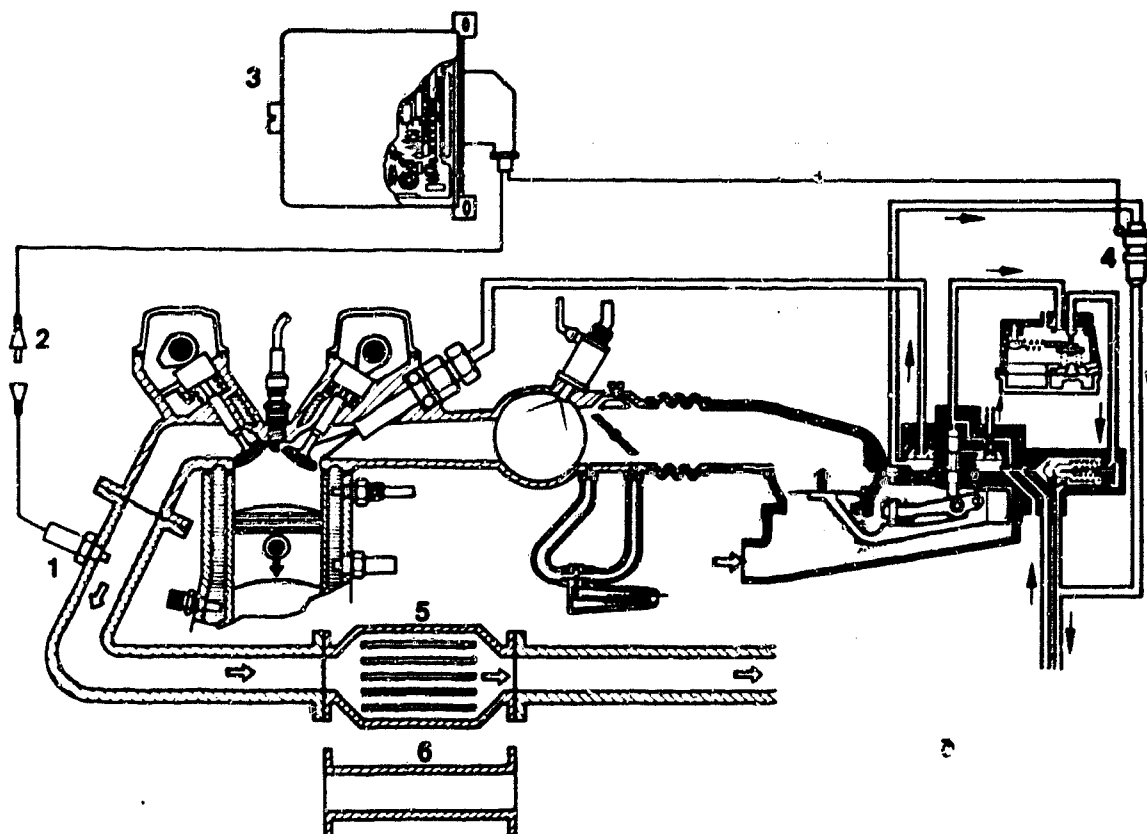
Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.



5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug

3 = Control unit
4 = Timing valve

5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.

If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M8x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!

Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.

The catalytic converter should be replaced by an intermediate pipe.

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After-sales Service

Motor Vehicle Service Information

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COLD-START, WARM-UP AND
ACCELERATION PROBLEMS
in Jetronic-equipped vehicles

VDT-I-Gen. 051 En

10.1984

(Supersedes Ed. 10. 82)

Customer complaint

- Starting problems with cold engine
- Engine bucking during warm-up
- Rough idle (fluctuations in engine speed)
- Engine miss during acceleration (flat spot)
- Loss of power

Cause

If the ignition and the Jetronic have been checked, and the test specifications are being reached, coking of the intake valves might be the cause of the problems sited.

Oil carbon, with its sponge effect, delays the continuous movement of the fuel from the fuel-injection valve to the combustion chamber.

As a result, the air-fuel mixture sometimes becomes so lean that it is no longer certain to ignite.



The loss in power is due to a reduction of the cylinder charge, and is the result of extremely serious coking.

Complex relationships between properties specific to the engine, the engine oil used, and fuels, as well as the driving cycles can produce such coking on the intake valves.

Checking

If coking is suspected, we recommend checking the intake valves using an endoscope or a motoscope. Deposits on the valve head and/or shaft can be seen with these instruments and evaluated.

Corrective measures

Take out the coked intake valves and remove the deposits mechanically.

Additives

There are no reliable results yet available on the effectiveness of cleaning additives or fuel additives. The use of fuel additives can cause deposits in the fuel system and damage certain plastics and seals.

Please direct questions and comments concerning the contents to our authorized representative in your country.



After-sales Service

Motor Vehicle Service Information

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LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND
VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

BOSCH

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N17

Motor Vehicle Service Information

Porsche 928 S



When direct trouble-shooting a specific LH2-Jetronic component, it is absolutely essential to look up the respective test step under the customer complaint.

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SectionCoordinatesTrouble-shooting program according to
customer complaintSTARTING MOTOR OPERATES, ENGINE FAILS
TO START OR STARTS ONLY WITH GREAT
DIFFICULTY.....

F 15 - G 10

Cold-start control.....F 17 - F 20

Auxiliary-air device.....F 21 - F22

Hot-wire air-mass sensor.....F 23 - G 2

Idle speed and CO adjustment.....G 3 - G 6

Hose lines of air-intake and fuel
systems, leaks.....G 7 - G 10ENGINE STARTS BUT THEN DIES.....

G 11 - G 24

Auxiliary-air device.....G 13 - G 14

Hot-wire air-mass sensor.....G 15 - G 18

Leak test on injection valves.....G 19 - G 20

Hose lines of air-intake and fuel
systems, leaks.....G 21 - G 24

SectionCoordinatesTrouble-shooting program

ROUGH IDLE/INCORRECT IDLE SPEED.....H 1 - J 4

Throttle valve and throttle-valve switch..H 3 - H 4

Idle speed and CO concentration.....H 5 - H 8

Auxiliary-air device.....H 9 - H 12

Injection valves (electrical and mechanical test, removal and installation).....H 13 - H 16

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POOR THROTTLE TAKE-UP.....J 5 - J 22

Throttle valve and throttle-valve switch..J 7 - J 8

Auxiliary-air device.....J 9 - J 12

Hot-wire air-mass sensor.....J 11 - J 14

Idle speed and CO concentration.....J 15 - J 18

Hose lines of air-intake and fuel systems, leaks.....J 19 - J 22



Trouble-shooting programENGINE MISSING UNDER ALL
OPERATING CONDITIONS.....K

1 - K 20

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throttle-valve switch).....K 9 - K 10

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Solenoid-operated injection valve (elec-
trical and mechanical test, removal/
installation).....K 17 - K 20FUEL CONSUMPTION TOO HIGH.....K

21 - L 10

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Idle speed and CO concentration.....L 3 - L 6

Solenoid-operated injection valve (elec-
trical and mechanical test, removal and
installation).....L 7 - L 10MAXIMUM ENGINE POWER/TOP SPEED NOT
REACHED.....L

11 - L 24

Throttle valve adjustment.....L 13 - L 14

Throttle-valve switch (full-load
enrichment).....L 13 - L 14

Delivery of electric fuel pump.....L 15 - L 16

Hot-wire air-mass sensor.....L 17 - L 20

Hose lines of air-intake and fuel
systems, leaks.....L 21 - L 24

SectionCoordinatesTrouble-shooting programCO CONCENTRATION AT IDLE TOO LOWOR TOO HIGH.....M 1 - M 22

Idle speed and CO concentration.....M 3 - M 6

Auxiliary-air device.....M 7 - M 10

Hot-wire air-mass sensor.....M 9 - M 12

Cold-start control.....M 13 - M 16

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Leak test.....M 19 - M 22

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